من ذكريات العمل (50)

مشروع قناطر نجع حمادي الجديدة

أعمال قواطع المياه ال Waterstop في المشروع

1- المقدمة: أهمية قواطع المياه في القناطر والسدود والمنشآت المائية

يُعد الـ **Waterstop** (قاطع/مانع تسرب المياه) أحد أهم عناصر الحماية غير المرئية في القناطر والسدود والمنشآت الهيدروليكية، إذ يمثل **خط الدفاع الأول** ضد تسرب المياه عبر **فواصل الخرسانة** .تعمل المنشآت المائية طوال عمرها التشغيلي تحت تأثير **ضغط هيدروليكي مستمر**، ما يجعل أي **فاصل صب** أو **فاصل تمدد** نقطة ضعف محتملة تسمح بمرور المياه إذا لم يتم تأمينها بصورة هندسية صحيحة.

تتجلى خطورة التسرب في أنه لا يقتصر على ظهور رشح موضعي فقط، بل قد يتطور تدريجيًا إلى مسارات تدفق تؤثر على:

- **اتزان واستقرار المنشأ :** قد تصل المياه إلى طبقات التأسيس أسفل البلاطات فتزيد **ضغوط الرفع (Uplift Pressure)** وتقل معاملات الأمان ضد **الانزلاق والانقلاب**..
- **متانة الخرسانة وحديد التسليح :**تسرب المياه يسمح بوصول الأملاح والكلوريدات والكبريتات إلى التسليح، ما يسبب **تآكل الحديد** وتشققات وتقشر الغطاء الخرساني، وبالتالي تقصير العمر الافتراضي للمنشأ.

كما لا تقتصر وظيفة الـ Waterstop على منع المرور المائي فقط، بل يمتد دوره إلى **استيعاب الحركات النسبية** بين الكتل الخرسانية الناتجة عن التمدد/الانكماش الحراري أو الهبوط الطفيف أو الاهتزازات التشغيلية، مع الحفاظ على إحكام الفاصل. ومن ثم فإن تنفيذ قواطع المياه أثناء الصب **أيسر وأقل تكلفة** من أعمال الإصلاح بعد التشغيل (التي غالبًا ما تكون معقدة وتستلزم حقن ومعالجات ووقف تشغيل جزئي).

2- أهمية ال waterstop لقناطر نجع حمادى

يُعد مشروع قناطر نجع حمادي الجديدة من أضخم مشروعات البنية التحتية الهيدروليكية على نهر النيل، حيث يقع عند الكيلو 360 خلف السد العالي بأسوان .يمتد المنشأ بعرض إجمالي قدره 336 متراً، متضمناً محطة توليد الكهرباء والمفيض والأهوسة الملاحية. وبناءً على التحليل الهيدروليكي للموقع، يبلغ منسوب الأمام للمياه إلى 65.90 متر، مع وجود أدنى نقطة للمنشآت الخرسانية عند منسوب 38.10 متر هذا الفارق الإجمالي في المناسيب الذي يصل إلى 27.8 متر يولد ضغوطاً هيدروستاتيكية هائلة هذا بالاضافة الى ان الهويس الملاحى من حيث خصوصية فتحات الملأ والتفريغ فانها تقع بالكامل اسفل قاع الهويس بخلاف قناطر اسنا حيث كانت حجرات الملأ والتفريغ تقع على جانبى حوائط الهويس مما استوجب اختيار نظام عزل مائي فائق القوة، عند جميع الفواصل الإنشائية وفواصل التمدد، مع معالجة دقيقة للتقاطعات والزوايا والوصلات الهجينة.

يعتمد بشكل أساسي على "الشفاه الفولاذية الجانبية" المدمجة في الحواجز المطاطية لزيادة مسار التسرب (Seepage Path)وضمان الإحكام التام تحت هذه الضغوط المرتفعة .وضمان تثبيت ال **water stop** فى مكانه المطلوب.

3. - انواع مانع التسرب ال water stop التى استخدمت فى المشروع

Metal sheet waterstop

Type	Drawings code	Total Width	Thickness
Metal Sheet	101	40 cm	3 mm

Expansion/Contraction joint waterstops

Type	Drawings code	Total Width	Width of expansion part	Thickness of expansion part
FS 310	102	310 mm	80 mm	8 mm
FM 300	103	300 mm	175 mm	10 mm
FMS 500 HS	104	500 mm	230 mm	12 mm
FMS 500	105	500 mm	230 mm	12 mm

تفاصيل الأنواع والمواصفات

تم اعتماد انواع متخصصة من إنتاج شركة (GUMBA) الألمانية أو ما يعادلها لتلبية احتياجات المشروع:

[101] قواطع المياه المعدنية(Steel Waterstops)

تُصنع من صلب (St 37). أبعادها: عرض 400 مم وسمك 3 مم .تُستخدم في كافة الفواصل الإنشائية المطلوبة لمنع تسرب المياه سواء أفقياً أو رأسياً.

قواطع المياه (waterstop)

- توجد بالمشروع خمسة أنواع من قواطع المياه
- 101 Steel waterstop 400/3mm steel 37.
- ويستخدم في الفواصل الإنشائيه

[102] الفواصل الإنشائية الرأسية المرنة

الموديل .**GUMBA FS 310 / FS 300R** :المواصفات: عرض كلي 310 مم، وسمك منطقة التمدد 8 مم. مزودة بشفاه معدنية جانبية لزيادة قوة التثبيت .تُستخدم في الفواصل الإنشائية الرأسية، ومناطق الربط بين الحوائط أو بين الحائط والبلاطة.

[103] قواطع فواصل التمدد للحوائط الساندة

الموديل .**GUMBA FM 300 / FM 320 R** :المواصفات: عرض كلي 300 مم، وسمك منطقة التمدد 10 مم. يتميز بتصميم مركزي مفرغ بمرونة عالية لاستيعاب إزاحة الهياكل، ومزود بشفاه معدنية جانبية للتثبيت في الشدات .يُستخدم بشكل أساسي في فواصل التمدد للحوائط الساندة.(Retaining Walls)

[104] و [105] قواطع التمدد والانكماش عالية التحمل

الموديل الأساسي) **GUMBA FMS 500R** :عرض 500 مم × سمك 12 مم.(

- **النوع :FMS 500R-MSU [104]** مخصص لفواصل التمدد والانكماش الكبرى، ويتميز بوجود قلب فوم إسفنجي مغلق الخلايا (Closed Cell Foam Rubber) في المركز لامتصاص الحركات الديناميكية العنيفة.
- **النوع :FMS 500R [105]** مخصص لفواصل التمدد القياسية ولا يحتوي على الفوم المركزي.

كلا النوعين مزودان بشفاه معدنية لتأمين الربط مع حديد التسليح.

104 Elastomer Waterstop FMS 500R

- ويستخدم في فواصل الإنكماش (Contraction Joints)

105 Elastomer Waterstop FMS 500R

- ويستخدم في فواصل التمدد (Expansion Joints)

نظام العزل والحقن الإضافي(WEBAC 1403)

يتكون من راتنج بولي يوريثان (Polyurethane Resin) منخفض اللزوجة وخالي من المذيبات بنسبة 100 .%يُستخدم لحقن الشقوق الشعرية وكدعم إضافي لإغلاق فواصل الصب الإنشائية الرطبة والجافة .**مميزاته:**

- يتفاعل ليشكل مانع تسرب مرن وعالي الكثافة.
- غير مسبب للتآكل لمعادن التسليح.

تخضع كافة المواد للمعايير الصناعية الألمانية الصارمة، بما في ذلك) DIN 7865 الجزءان 1 و 2 ، DIN 18197 لعزل الفواصل، و DIN 18195-8/9لأنظمة العزل، بالإضافة إلى ZTV-W للتحكم في التشقق، و DIN 1045و DIN 1048 لضمان جودة واختبار الخرسانة. يجب أن تحقق المواد المطاطية الخواص التالية:

تخضع جميع القواطع المطاطية لاختبارات معملية صارمة قبل التوريد، ومن أهم المعايير:

- مقاومة الشد أكبر من 10 نيوتن/مم².
- الاستطالة عند الكسر تتجاوز 380.%
- مقاومة التمزق أكبر من 8 نيوتن/مم².
- **التصاق المعدن بالمطاط :(Metal Adhesion)** شرط أساسي أن يكون الفشل ناتجاً عن كسر هيكلي في المادة المطاطية نفسها (Structural fracture in the elastomer) وليس انفصالاً في الرابط الكيميائي بين المعدن والمطاط.
- **الاستقرار الكيميائي :**مقاومة تامة للقلويات والبيتومين الساخن دون أي تغيير في الأبعاد أو الخواص.

4- تصنيف وتوصيف فواصل المنشآت الخرسانية

تم تصنيف الفواصل في المشروع لتلبي المتطلبات الإنشائية والميكانيكية وفق المعايير التالية:

فواصل الإنشاء(Construction Joints)

- هي فواصل ناتجة عن تقسيم صب الخرسانة إلى مراحل وفق رسومات التنفيذ.
- تكون غالبًا أفقية أو رأسية وتظهر كخط مستقيم على الوجوه الظاهرة.

- تخصيص الـ Waterstop: يتم تركيب قواطع مياه معدنية بعرض 400 مم وسُمك 3مم في الفواصل الإنشائية المطلوب كتامتها مائيًا (مع الاستثناءات المحددة بالرسومات حيث يُسمح بموانع مطاطية للفواصل الرأسية).

- الفواصل الباردة :(Cold Joints) هي فواصل غير مخطط لها ناتجة عن انقطاع الصب. في حال حدوث عطل في المعدات أو توقف مفاجئ، يجب على المقاول فوراً دمج الخرسانة غير المتصلبة وتشكيلها على هيئة منحدر مستقر ومنتظم .(Stable and uniform slope) إذا تعذر اختراق الخرسانة بالهزاز، تُعامل معاملة فواصل الإنشاء، شريطة موافقة الاستشاري على سلامتها الإنشائية.
- فواصل الصب على مراحل :(Stage Concreting) تُخصص لتركيب المعدات الكبيرة والصغيرة، حيث تُترك هذه الفواصل مفتوحة لفترة تتراوح بين شهر أو عدة أشهر .ويُلزم المقاول بإجراء عملية النقر بالبوش-هامر (Bush-hammering) لتخشين الأسطح وتنظيفها تماماً قبل صب المرحلة الثانية.
- فواصل التمدد (Expansion Joints)
- تُنشأ لمنع انتقال القوى بين المنشآت/الكتل أو لاستيعاب التغيرات الحجمية الناتجة عن الحرارة.
- مكونات فواصل التمدد قد تشمل (حسب الرسومات):

  - Elastomeric Waterstop
  - Steel Dowels
  - Concrete Shear Keys –
  - مواد حشو مُشكلة مسبقًا، طلاء بيتوميني مانع للالتصاق، Joint Sealer، شرائط مطاطية... إلخ.

5. <u>منهجية التنفيذ والربط الميكانيكي</u>

تعتمد سلامة النظام على دقة التنفيذ، حيث يجب أن تكون كافة قطع الربط المعقدة) مثل الوصلات على شكل T، والزوايا، والوصلات الانتقالية (Transitions 102-104 **منتجة في المصنع Factory) produced)** لضمان جودة التصنيع، بينما يتم تنفيذ الوصلات الطولية المستقيمة فقط في الموقع عبر تقنية "الفلكنة الحرارية (Hot Vulcanization) "باستخدام وحدات فلكنة وقوالب متخصصة وذلك لضمان الطبخ الكامل لمنطقة وصل الجزء المطاط . بالنسبة للربط بين الشرائح الفولاذية (101) والمطاطية، يتم اللحام الغازي (Gas shield welding) للشفاه الفولاذية، أو الربط الميكانيكي بالمسامير القلاووظ مع

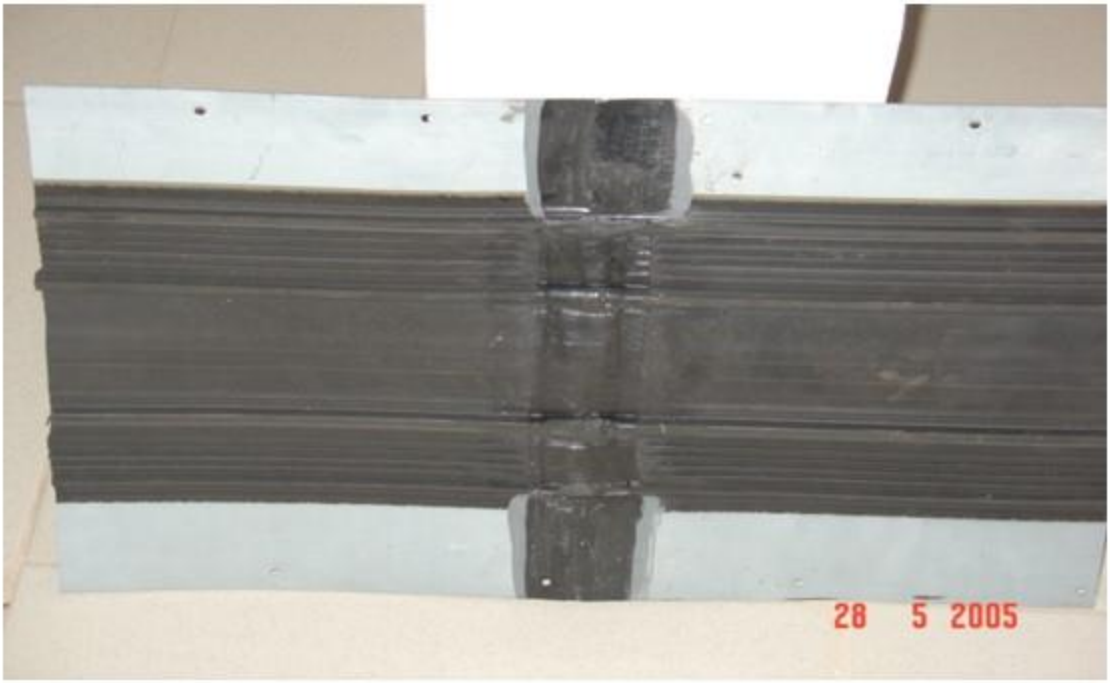
وضع حشوة مطاطية خام بسمك 3 مم. تشتمل مكونات فاصل التمدد على ألواح بوليسترين بسمك 30 مم وكثافة تقريبية 20 كجم/م^3، وأسياخ دويل (ASTM A615M Grade 400) بطول 40 سم، مع دهان وجه الفاصل بطبقتين من البيتومين) مثل I (GOL-T لضمان استقلالية الحركة.

Steel to Elastomer Waterstop

Connection of waterstop

Steel to Steel waterstop

Elastomer To Elastomer Waterstop



6.نظام الرقابة على الجودة والاختبارات

- **الاختبارات المعملية :**يجب اختبار جميع أنواع الـ Waterstop في مختبر معتمد ببلد المنشأ قبل الشحن، وتشمل الاختبارات: قوة الشد، الاستطالة، امتصاص الماء، الوزن النوعي، ومقاومة القلويات والصدمات وفقاً لـ **DIN 7865 Part 2.**
- **الوثائق المطلوبة :**تقديم شهادات المنشأ (Mill Certificates) وشهادات المختبر مع كل توريدة، مع توفير عينات مجانية للاعتماد مع العرض الفني.
- **الفحص الميداني :(Site Inspection)** تخضع كافة الشرائح المركبة لفحص ميكانيكي دقيق (مثل اختبار المفك للتأكد من جودة الفلكنة). ويُعد الحصول على موافقة "صاحب العمل " (Employer)بعد المعاينة نقطة توقف إلزامية (Hold Point) قبل صب الخرسانة.
- **التأهيل الفني :**يشترط تعيين أخصائي من الشركة المصنعة لتدريب العمالة في الموقع، ولا يسمح بمباشرة العمل إلا للعمال الحاصلين على شهادة كفاءة معتمدة من المصنع.

7. السلامة المهنية والبيئية(ISO 14000)

- **الاعتبارات البيئية :**تُمنح الأولوية للموردين الحاصلين على **ISO 14000**.يجب تقديم ورقة بيانات سلامة المواد (MSDS) التي تشمل المكونات المطاطية، بالإضافة إلى **مذيبات الفلكنة (Vulcanizing Solvent)**ومواد الربط.(Bonding Agents)
- **المخاطر التشغيلية :**يجب اتخاذ تدابير وقائية صارمة أثناء عملية الفلكنة الحرارية والتعامل مع المذيبات الكيميائية، وفقاً لجداول بيانات السلامة المقدمة من المصنع.

8. بروتوكولات التوريد والتخزين الفني

- **اللوجستيات :**التوريد بنظام CIF للموانئ المصرية. الجدول الزمني يحدد التوريد الأساسي في **أكتوبر 2004**، مع الالتزام بتوريد الكميات الإضافية خلال 4 أسابيع من الطلب.
- **التخزين الميداني :**يجب التخزين في ظروف وقائية من العوامل الجوية (الحرارة والرطوبة). ويشمل التوريد كافة الملحقات الضرورية مثل: التلك(Talcum) ، مواد الربط، وشريط البنتونيت (Bentonite Tape)لضمان جاهزية التركيب في أي لحظة.

خاتمه

تُعد أعمال الـ Waterstop في مشروع قناطر نجع حمادي الجديدة جزءًا حاكمًا من منظومة الأمان المائي للمنشأ، إذ تضمن:

- **تكوين حاجز مائي مستمر عند فواصل الإنشاء والتمدد.**
- **تقليل مخاطر الرشح والنحر الداخلي ورفع الضغوط أسفل المنشأ.**
- **حماية الخرسانة والتسليح وإطالة العمر التشغيلي وتقليل الصيانة.**

ويتحقق ذلك عبر الالتزام الصارم بالمعايير DIN/ASTM/ACI) حسب التطبيق(، واعتماد الطرازات المناسبة لكل فاصل، والتنفيذ الدقيق للوصلات مع تطبيق منظومة QA/QC وتدابير السلامة والتخزين السليم.

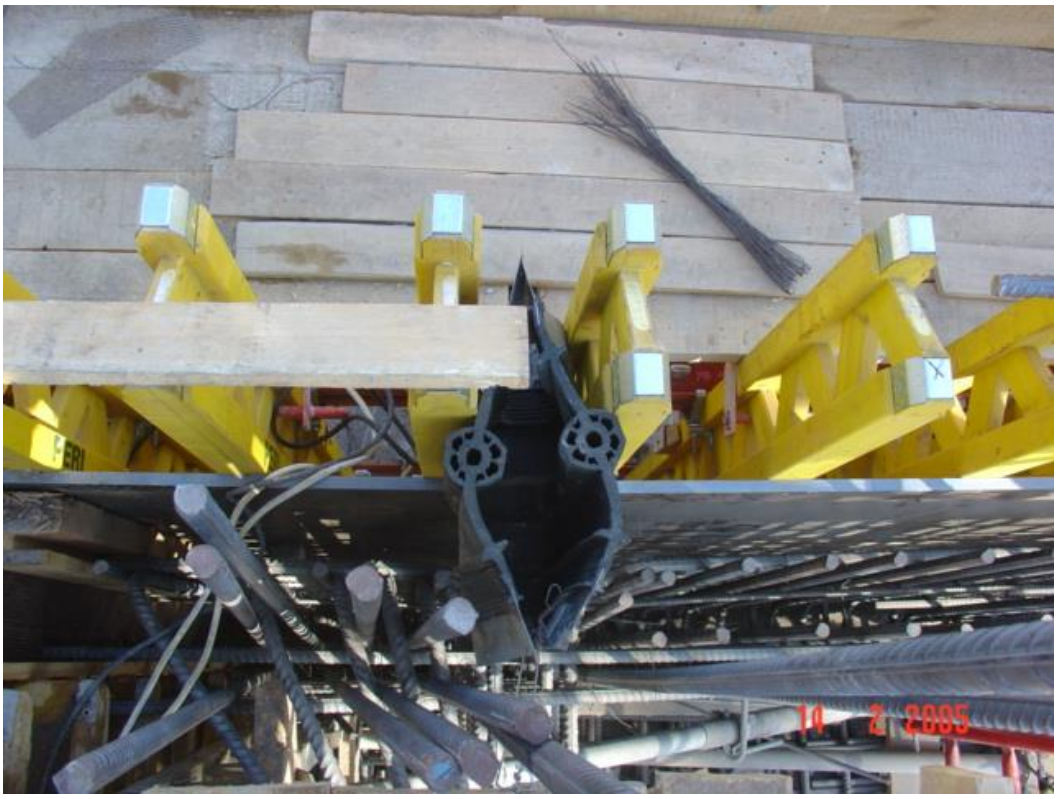
اردت التذكير بهذه الاعمال وشكر كل من ساهم فيها والترحم على من انتقل الى جوار ربه رحمهم الله رحمة واسعة .

شكر واجب للسيد المهندس مجدى عباس رئيس الادارة المركزية والمهندس المقيم الاسبق لمشروع قناطر اسيوط الجديدة للتدقيق والمراجعة .

المصادر:

- يوميات وصور اثناء التنفيذ
- مستندات العقد
- من مستندات المقاول Method Statements

بعض الصور اثناء التنفيذ



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Metal sheet waterstop

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Expansion/Contraction joint waterstops

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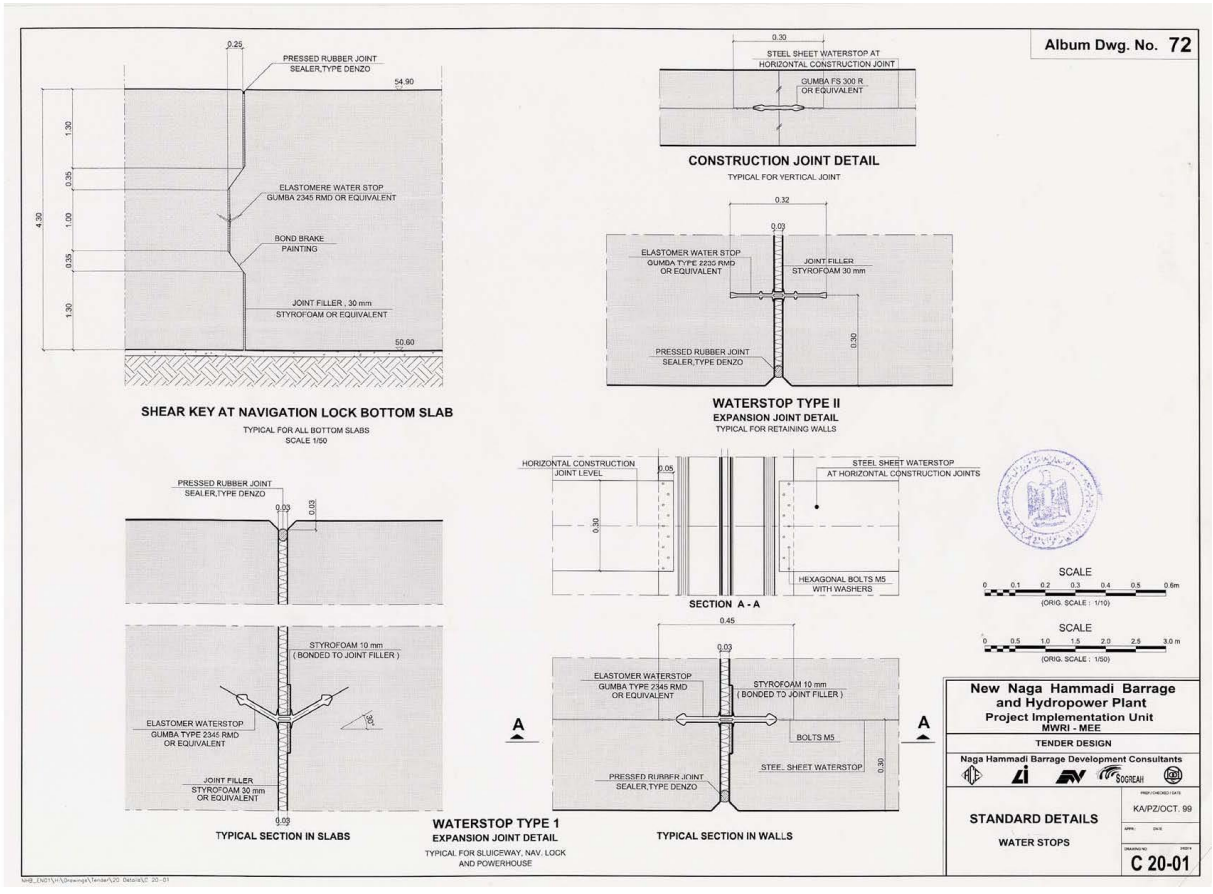

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PART I - General Technical Specifications

1. GENERAL

The new Naga Hammadi Barrage is located on the Nile river at about 360km downstream of the Aswan high dam. At this location, the Nile river bed is at 50.00m asl and the width is 300m. The nominal upstream water level of the new Barrage will be at 65.90m asl.

The lowest bottom of concrete structures will be at 38.10m asl and the general access level will be at 69.00m asl . The width of the barrage including powerhouse, sluiceway and navigation locks will be 336m.

The supply, object of this specification, consists in :

- supply of steel waterstops,
- supply of elastomeric waterstops,
- supply of plant equipment, accessories and consumables for site assembly,
- technical assistance and services.

2. QUALITY STANDARDS

The publications listed below form part of these Specifications. Concrete materials, testing methods and procedures shall conform to the applicable standards of DIN. The applicable standards of ASTM, ACI and/or those contained in the US Bureau of Reclamation "Concrete Manual" shall be applied when corresponding DIN standards are not published.

Specific quality standards regarding materials and practice that are applicable to the waterstops works of the project include but are not limited to the following:

DIN: Deutsche Industrie Norm	Contents of Standard
ZTV-W	Control of cracking in concrete structures
DIN 1045	Concrete, reinforced and prestressed concrete structures. Quality assurance systems for concrete construction
DIN 18197 E	Waterproofing of joints in concrete constructions with waterstops
DIN 1048	Testing concrete
DIN 18195-8/9	Water-proofing of buildings - part 8 : Water-proofing over joints for movements
ZTV - RISS	Technical specification for polyurethane grout and related injection methods

DIN: Deutsche Industrie Norm	Contents of Standard
DIN 7865	Elastomeric preformed gaskets for sealing of joints in concrete

In case of conflict between the present specifications and the above, the present specifications shall take precedence.

3. JOINTS IN CONCRETE STRUCTURES

3.1. Construction Joints

General

1) Concreting shall be carried out continuously up to the construction joints, the arrangement and positions of which shall be as shown on the Construction Drawings, or as approved by the Employer. Also, whenever concreting is forced to cease and placed concrete has become so hard that it does not permit the entry of a vibrator, a new construction joint shall be formed conforming to these Specifications.

2) The position of certain construction joints shown on the Construction Drawings as mandatory shall not be altered. The Contractor may propose for approval different locations of other construction joints for reasons of concrete placement. Necessary rearrangement of steel reinforcement arising from such modifications shall be to the Contractor's debit.

3) Construction joints shall be approximately horizontal or vertical. The joints shall appear as straight lines, produced by a board fixed to the formwork, at exposed faces.

4) The surface of construction joints upon or against which new concrete is to be placed and to which new concrete is to adhere shall be clean, rough, and free of water when covered with fresh concrete. The laitance, loose or defective concrete and foreign material shall be removed from the surface of existing concrete. The previous concrete lift shall be saturated by water for approximately 24 hours, but shall be surface dry when the successive lift is placed.

5) For horizontal construction joints, the surface of the hardened concrete shall be scabbled (chiselled) and all loose material shall be removed. Before placing new concrete, the surface shall be thoroughly cleaned with air-water jet, to remove all laitance, scum and foreign material.

6) For vertical construction joints, formwork shall prevent the loss of fine material from the concrete after placing. After removal of the formwork, the fresh concrete surface shall be scabbled (chiselled), and honeycombs - if any - be completely removed. Before placing new concrete, the surface shall be thoroughly cleaned by air-water jet.

7) If the Contractor wishes to essentially deviate from the above, he shall submit a detailed description of the methods applied in preparation of the surface of construction joints, for approval be the Employer.

8) Water used in cutting, washing and rinsing of concrete surfaces shall not cause stain, discolouring or affect exposed surfaces of the structures.

9) Where indicated on the Construction Drawings, construction joints will be formed with central shear keys. The Contractor's proposed method for forming such keys shall be subject to the approval by the Employer.

10) Steel sheet waterstop 40 cm wide and 3 mm thick shall be placed at all construction joints which are required to be watertight except in places where elastomere waterstops for vertical construction joints are approved by the Employer. Steel sheet shall comply with the requirements of ASTM A366M, unexposed class. Horizontal steel sheet waterstops in vertical joints shall be installed with sufficient slope to avoid air trapping with the formwork.

11) Steel sheet waterstops at horizontal construction joints shall be gas shield welded to lateral steel flanges of connecting elastomeric waterstops. Alternatively, steel sheet waterstops may be bolted to the lateral steel flanges of connecting elastomeric waterstops with a 3 mm raw rubber sealing strip in between. Details proposed by the Contractor shall be subject to approval by the Employer.

Cold Joint

1) A cold joint is an unplanned joint which is the result of hardening of the concrete surface before the next batch is placed against it. Cold joints are undesirable and should be avoided.

2) In the event of equipment breakdown, or other unforeseen prolonged interruption the continuation of placing may be not allowed. When such an event occurs, and the unconsolidated concrete may harden to the extent that later vibration would not fully consolidate it, the Contractor shall immediately consolidate such concrete to a stable and uniform slope.

3) If delay in placement is short and it is still feasible to penetrate the underlying concrete, placement shall resume with care to thoroughly penetrate and re-vibrate the concrete surface placed before the delay.

4) If the concrete cannot be penetrated with the vibrator, the cold joint shall be treated as a construction joint, if the design requirements tolerate such joint. If such joint would impair the structural integrity of the structure, as determined by the Employer, the concrete, or a part of it, shall be repaired or removed as directed by the Employer.

Construction Joints for Stage Concreting

1) Constructions joints for stage concreting are joints, or joint systems where infill concrete or bays shall not be placed before one or several months after placing of the first stage concrete.

2) Such joints are provided for installation of major and minor equipment pieces in the floor and walls in certain structures and may be shown on the Tender Drawings.

3) Waterstops shall be provided in construction joints for stage concreting, where shown in the construction drawings or otherwise directed by the Employer.

4) When shown on the construction drawings or when necessary, as determined by the Employer, surfaces of construction joints for stage concreting shall be cleaned and roughen by bush-hammering after removal of the forms and prior to placement of the second stage concrete. These surfaces may be penetrated by a number of reinforcement bars.

3.2. Expansion Joints

General

1) Expansion joints in the concrete structures shall be constructed at such locations and to such dimensions as shown on the Construction Drawings. The Contractor shall supply and install the various joint components as specified herein, as shown on the Construction Drawings and in accordance with the manufacturers recommendations.

2) No fixed metal embedded in the concrete shall be continuous through an expansion joint except where expressly shown on the Construction Drawings.

3) Expansion joints are joints provided in concrete structures to prevent transfer of forces from structure to structure or to accommodate volumetric changes due to temperature rise. Expansion joints may be provided with the following elements as shown on the Construction Drawings:

- Elastomeric waterstop
- Steel dowels
- Concrete shear keys
- Preformed expansion joint filler panels
- Bond breaker bituminous coating
- Joint sealer
- Elastomeric strips

Materials

1) Elastomeric waterstops shall comply with the requirements of DIN 7865 and shall be, as shown on the Drawings, 2235 RMD and 2345 RMD with lateral steel flanges, as supplied by Gumba of Germany, or approved equivalent. Elastomeric waterstops and strips shall have the following properties:

Tensile strength	> 10 N/mm^2
Elongation at break	> 380%
Tear propagation strength	> 8 N/mm²

2) Steel dowels shall be about 40 cm long plain steel bars conforming to ASTM A615M, Grade 400, diameter approximately 25 mm. Prior to placing the subsequent pour, each bar shall be wrapped or coated to half the length with bituminous materials acceptable to the Employer. As an alternative to such coating a galvanised mild steel or PVC cap may be used.

3) Preformed expansion joint filler panels shall consist of expanded polystyrene, 30 mm thick, with a specific weight of approximately 20 kg/m^3. They shall be waterproof and shall not absorb water. Alternative materials complying with the requirements of DIN 18107 E may be proposed by the Supplier for the Contractor's approval.

4) Bond breaker bituminous coating shall be used to facilitate independent movement between two units that would otherwise behave monolithically and shall consist of 2 layers of a product similar to IGOL-T as supplied by Sika Switzerland, or equivalent.

5) Joint sealer shall be a sealing cord based on closed-cell elastomers with a smooth outer skin and a circular cross-section as supplied by Fermadur of Germany, or approved equivalent, and shall have the following properties:

Tensile strength	> 2 N/mm^2	DIN 4060
Breaking strain	> 350%	DIN 4060

Construction

1) Waterstops shall be joined and fixed in place in accordance with manufacturer's recommendations to form a continuous watertight barrier. All cross-pieces, T-pieces and corner-pieces shall be factory produced. All remaining linear joints shall be hot vulcanised on site in accordance with the manufacturer's recommendations. All splices shall be neat with the ends of the joined waterstops in true alignment. A manufacturer's own specialist shall be appointed for on-site training of the Contractor's labour until such labour becomes skilled to the satisfaction of the manufacturer and the Employer. A mitre-box guide and portable knife shall be provided for cutting the ends to be joined to insure good contact between joined surfaces. The Contractor shall supply all necessary supports and ties required for placing the waterstop and shall position it so that its central axis coincides with the joint centre. Care shall be taken that waterstop does not bend or deflect during concreting. Concrete adjacent to the waterstop shall be thoroughly worked to ensure full contact with the waterstop but without damaging it. Prior to commencement of concrete placing, the waterstops placed shall be inspected by the Employer.

2) Before casting the second part of an expansion joint, the whole surface will be covered with preformed expansion joint filler panels as shown on the Construction Drawings. The panels shall be cut to the size and shape of the joint and shall be glued (or clamped by methods to be approved by the Employer) onto the joint face and tightly joined. Holes and joints in the filler panels shall be filled with mastic to prevent passage of mortar or concrete from one side to the other. Particular care shall be taken to ensure that all surfaces of the shear keys are covered.

3) Before applying the joint sealer, the joint shall be raked out to a depth as specified. All laitance, dirt, oil and foreign matter shall be removed from the joint by sandblasting, compressed air, grinding discs, or other effective means, and the concrete surfaces coated with an approved suitable primer as recommended by the sealer manufacturer. Joint sealer shall be placed after the concrete curing period in accordance with manufacturer's instructions. The concrete surface temperature shall not be higher than 30°C at the time of placing unless otherwise

approved, and the concrete shall be surface dry. After placing, the sealer shall be protected from the effects of water for a period of at least 10 hours.

4) Joint sealer that becomes unbounded from the concrete, or cracks, or shows any other defects before final acceptance of the work, shall be replaced by the Contractor.

5) Bituminous coating or elastomeric strips of adequate thickness shall be used as bond breaker on the inclined surfaces of the shear keys where expansion joint filler is not used. Details shall be shown on Construction Drawings.

4. TESTS DURING THE PERFORMANCE OF THE WORKS

Waterstops

1) All types of waterstops shall be tested in a recognised laboratory prior to shipment to the site. Test specimens shall be furnished by the manufacturer and the tests shall be carried out at the place of manufacture.

2) Waterstops shall be tested for their tensile strength, elongation, duration, water absorption, specific gravity, effect of alkali and impact resistance.

PART II - Particular Technical Specifications

1. SCOPE OF SUPPLY

1.1. General

The supply, object of this specification, consists in :

- supply of steel waterstops,
- supply of elastomeric waterstops,
- supply of plant equipment, accessories and consumables for site assembly,
- technical assistance and services.

1.2. Construction Joints

1) Steel sheet waterstops (101) 40 cm wide and 3mm thick shall be placed at all construction joints which are required to be watertight except where elastomere waterstop for vertical construction joints (102) are required (cf. construction drawings). Steel sheet shall comply with the requirements of ASTM A366M unexposed class. Horizontal steel sheet waterstops in vertical joints shall be installed with sufficient slope to avoid air trapping with the formwork.

2) Steel sheet waterstops at horizontal construction joints shall be gas shield welded to lateral steel flanges of connecting elastomeric waterstops. Alternatively, steel sheet waterstops may be bolted to the lateral steel flanges of connecting elastomeric waterstops with a 3 mm raw rubber sealing strip in between. Details proposed by the Contractor shall be subject to approval by the Employer.

1.3. Expansion Joints

1) Expansion joints are joints provided in concrete structures to prevent transfer of forces from structure to structure or to accommodate volumetric changes due to temperature rise. Expansion joints may be provided with the following elements as shown on the Construction Drawings:

- Elastomeric waterstop,
- Steel dowels,
- Concrete shear keys,
- Preformed expansion joint filler panels,
- Bond breaker bituminous coating,
- Joint sealer,
- Elastomeric strips.

2) No fixed metal embedded in the concrete shall be continuous through an expansion joint except where expressly shown on the Construction Drawings.

2. APPROVAL OF MATERIALS AND CERTIFICATES

2.1. Suppliers Environmental Certification

Manufacturers are informed that where materials and equipment of equal quality and prices are available from more than one supplier, preference shall be given to those suppliers certified as implementing environmental management systems under ISO 14000, BS 7750, or EMAS.

2.2. Mill Certificates

Manufacturer's mill certificates and laboratory certificates are required.

2.3. Free of charge samples

Free of charge samples of all types of material and accessories shall be provided by the Manufacturer with the Quotation.

3. QUALITY STANDARDS

Materials, testing methods and procedures shall conform to applicable standards of DIN.

3.1. Use of Waterproofing

"Use of Waterproofing and Other Barrier Systems for Concrete" according to **DIN 18195-8/9.**

3.2. Material

Elastomer Waterstop shall conform to applicable standard **DIN 7865 part 1.**

3.3. Design, Dimensions and Tolerances

Design, Dimensions and Tolerances as specified in **DIN 7865 part 1** shall be applied**.**

The waterstop to be supplied are as shown by the Construction Drawings, i.e. typical products from GUMBA of Germany, or approved equivalent, and listed below :

- 102 : FS 300R (with lateral steel flange) - elastomer waterstop in vertical construction joints,
- 103 : FM 320 R (with lateral steel flange) - elastomer waterstop in expansion joints (retaining wall),
- 104 : FMS 500R-MSU (with closed cell foam rubber and lateral steel flange) - elastomer waterstop in contraction / expansion joints,
- 105 : FMS 500R (with lateral steel flange) - elastomer waterstop in expansion joints.

(Note : "102", "103", "104", and "105" denote the designation adopted by the Designer on the Construction Drawings).

3.4. Physical properties

Physical properties shall conform to applicable standard **DIN 7865 part 2.**

Elastomeric waterstop and strips shall have the following properties, according to applicable standard **DIN 7865** :

- Tensile strength **> 10 N/mm²**
- Elongation at break **> 380 %**
- Tear propagation strength **> 8 N/mm²**
- Dimensional stability when exposed to hot bitumen: **No change in shape**
- Metal adhesion: **Structural fracture in the elastomer**

4. TESTING

All types of waterstops shall be tested in a recognised laboratory prior to shipment to the site. Test specimens shall be provided by the manufacturer and the tests shall be carried out at the place of manufacture. Waterstop testing shall conform to applicable standard **DIN 7865 part 2.**

Waterstops shall be tested for their :

- tensile strength,
- elongation at break,
- tear propagation strength,
- duration,
- water absorption,
- specific gravity,
- effect of alkali
- impact resistance.

5. EQUIPMENT / MATERIAL

5.1. Equipment

Two pieces of Vulcanization Unit with 2 pieces of moulds for site vulcanisation for each type of elastomer waterstop profile are required.

5.2. Tools

Special knifes, Rollers and Taping Rods shall be provided for cutting the ends to be joined to insure good contact between joined surfaces.

5.3. Accessories and Consumables

Accessories and consumables shall be provided according to Manufacturers instructions.
The manufacturer shall fill in the units and the quantities of the B.O.Q. .

Expected accessories include :

- Vulcanizing Solvent,
- Adhesion Foil,
- Bonding Agent,
- Bonding Agent for steel rubber connection incl. primer,
- Talcum for steel rubber connections incl. primer,
- Bentonite Tape for steel rubber connection incl. primer,
- Waterstop clips for elastomer waterstop,
- Steel connectors.

The Manufacturer shall especially inform the Contractor of each accessory environmental impacts.

6. DELIVERY/STORAGE

Quality certificates shall be enclosed with each delivery, quotation or offer.

The Manufacturer shall specify site storage conditions and site storage duration according to constraints run into site.

The Manufacturer shall specify means and form of delivery on site (packing, rolls, specified lengths, form pieces and systems of delivery).

7. SAFETY AND ENVIRONMENTAL MATERIAL DATA SHEET

7.1. Environment

The Manufacturer shall inform the Contractor of waterstop joint environmental impacts.
The Manufacturer shall especially inform the Contractor of accessories environmental impacts (including vulcanizing equipment, vulcanising solvent, bonding agent, bentonite tape, etc.).

The Manufacturer shall provide the Environmental Material Data Sheet.

Manufacturers are informed that where materials and equipment of equal quality and price are available from more than one supplier, preference shall be given to those suppliers certified as implementing environmental management systems under ISO 14000, BS 7750, or EMAS.

7.2. Safety

The Manufacturer shall inform the Contractor of safety risks and safety measures to be taken on site during waterstops setting up - especially for vulcanisation on site.

The Manufacturer shall provide the Safety Material Data Sheet.

8. TECHNICAL ADVICE AND SERVICE

During all the duration of waterstops work, the Manufacturer shall offer Technical advice for joint design, waterstop material, profiles during the design, construction stages to ensure the correct decision are made.
For all prefabricated pieces, shop drawings shall be made by the Manufacturer. Those drawings are based on the construction drawings and have to be approved by the NHB JV before start of production. In appendix 5 is attached an extract of the Construction Drawings, for reference only.

A Manufacturer's own specialist shall be appointed for on-site training of the Contractor's labour until such labour becomes skilled to the satisfaction of the Employer. After the successful end of the on-site training, labourers shall get a certificate from the manufacturer.

The Manufacturer shall provide a method statement for installation and maintenance of all materials described in the schedule of quantities.
The Manufacturer shall inform the Contractor of recommendations to join and fix in place waterstop to form a continuous watertight barrier - especially for linear joints hot vulcanization on site.

9. PROGRAMME OF DELIVERY

Two deliveries:

- the first one with all order - quantities required,
- a second one with extra-requirements.

Delivery date:

- Material delivery according Contract in October 2004,
- Extra quantities according site requirement 4 weeks after order.

10. SHIPMENT

Shipment CIF to Egyptian port, packing and transportation are included in unit rates.

Appendix 1 - Bill of Quantities

Item	Description	Qty	Unit	Unit Rate [Currency]	Amount [Currency]
1	**Steel Waterstops**				
1.1	**Construction joint waterstop (101)** *Fabrication and delivery of steel sheets* *W=400mm; T=3mm; L= 25m* *Material St 37*	4 000	m	_____	_____
	TOTAL Item 1				_____
2	**Standard Elastomer (Rubber) Waterstops**				
2.2	**Construction joint waterstop (102)** *According DIN 7865 1+2* *Fabrication and delivery of elastomere waterstop joint tape* *Type : FS 310*	300	m	_____	_____
2.3	**Expansion joint waterstop (103)** *According DIN 7865 1+2* *Fabrication and delivery of elastomere waterstop joint tape* *Type : FM 300*	15	m	_____	_____
2.4	**Contraction / Expansion joint waterstop (104)** *According DIN 7865 1+2* *Fabrication and delivery of elastomere waterstop joint tape* *Type : FMS 500*	550	m	_____	_____

Item	Description	Qty	Unit	Unit Rate [Currency]	Amount [Currency]
2.5	**Contraction / Expansion joint waterstop (105)** *According DIN 7865 1+2* *Fabrication and delivery of elastomere waterstop joint tape* *Type : FMS 500*	750	m		
	TOTAL Item 2				
3	**Injection hose**				
3.1	**Injection hose (107)** *According ZTV-RISS* *Delivery of injection hose* *Including rent ends* *Type : WEBAC type 1, Pat.-Nr. 3507806 or similar*	250	m		
3.2	**Injection Material** *According ZTV-RISS* *Delivery of 2-comp. PUR-resin injection material* *Type : WEBAC 1403 or similar*		ℓ		
3.3	**Injection equipment** *One set of equipment to inject PUR-resin according manufacturer instructions*		set		
3.4	**Accessories** *Fixing Clips to fix the hose on the concrete* *Quantities according manufacturer recommendations*				
	TOTAL Item 3				

Item	Description	Qty	Unit	Unit Rate	Amount
				[Currency]	[Currency]
4	**Junctions for Elastomer (Rubber) Waterstops**				
	Fabrication and delivery only Material consumption measured and paid according the related Item 2.				
4.1	**Type 102 vertical edge** *According DIN 7865 1+2* *Fabrication and delivery of elastomer waterstop form pieces* *Shape: 102 vertical edge* *Type : FS 310*	24	Pcs	_____	_____
4.2	**Type 102 vertical T** *According DIN 7865 1+2* *Fabrication and delivery of elastomer waterstop form pieces* *Shape: 102 vertical T* *Type : FS 310*	3	Pcs	_____	_____
4.3	**Type 104 vertical edge** *According DIN 7865 1+2* *Fabrication and delivery of elastomer waterstop form pieces* *Shape: 104 vertical edge* *Type : FMS 500*	20	Pcs	_____	_____
4.4	**Type 104 vertical T** *According DIN 7865 1+2* *Fabrication and delivery of elastomer waterstop form pieces* *Shape: 104 vertical T* *Type : FMS 500*	15	Pcs	_____	_____
4.5	**Type 105 vertical edge** *According DIN 7865 1+2* *Fabrication and delivery of elastomer waterstop form pieces* *Shape: 105 vertical edge* *Type : FMS 500*	12	Pcs	_____	_____

Item	Description	Q' ty	Unit	Unit Rate [Currency]	Amount [Currency]
4.6	**Type 104-105 vertical edge** *According DIN 7865 1+2* *Fabrication and delivery of elastomer waterstop form pieces* *Shape: 104-105 vertical edge* *Type : FMS 500*	8	Pcs	_____	_____
4.7	**Type 104-105 trans** *According DIN 7865 1+2* *Fabrication and delivery of elastomer waterstop form pieces* *Shape: Transition 104-105* *Type : Transition FMS 500*	10	Pcs	_____	_____
4.8	**Type 102-104 trans** *According DIN 7865 1+2* *Fabrication and delivery of elastomer waterstop form pieces* *Shape: Transition 102-104* *Type : Transition FS 310 and FMS 500*	2	Pcs	_____	_____
	TOTAL Item 4				_____

Item	Description	Qty	Unit	Unit Rate [Currency]	Amount [Currency]
5	**Equipment**				
5.1	**Vulcanizing Unit** *With 2 pieces of moulds for site vulcanizations for each type of elastomere waterstops profile (the moulds are exchangeable parts)*	2	Pcs		
	TOTAL Item 5				
6	**Vulcanizing Accessories**				
	According manufacturers instructions. Please fill in the units and the quantities.				
6.1	**Vulcanizing Solvent**				
6.2	**Adhesion Foil**				
6.3	**Bonding Agent**				
6.4	**Bonding Agent** For steel rubber connections incl. primer				
6.5	**Talcum** For steel rubber connections incl. primer				
6.6	**Bentonite tape** For steel rubber connections incl. primer				
	TOTAL Item 6				

Item	Description	Qty	Unit	Unit Rate [Currency]	Amount [Currency]
7	**Accessories**				
	According manufacturers instructions. Please fill in the units and the quantities.				
7.1	**Waterstop Clips for elastomer waterstop** *For fixing elastomer waterstop on formwork or rebar reinforcement*				
7.2	**Steel Connector** *For Steel / Rubber connections*				
	TOTAL Item 7				
8	**Tools**				
8.1	**Special Knifes**	5	Pcs		
8.2	**Roller**	5	Pcs		
8.3	**Taping Rods**	5	Pcs		
	TOTAL Item 8				
9	**Testing Equipment**				
	TOTAL Item 9				

SUMMARY	
Item	**Amount [Currency]**
Item 1	
Item 2	
Item 3	
Item 4	
Item 5	
Item 6	
Item 7	
Item 8	
Item 9	
TOTAL	

Appendix 2 - List of Alternatives Proposed by the Supplier with codes, rules or specifications

List of alternatives proposed by the suppliers with codes, rules or specifications

CODES RULES OR SPECIFICATIONS N°	DESCRIPTION	
	DEVIATION	PROPOSITION

Company : ……..

Name : ……
Title :……

Appendix 3 - Waterstop Drawings Details

GENERAL NOTES :

- ALL LEVELS GIVEN ON CONCRETE DIMENSION DRAWINGS ARE RELATED TO RAW CONCRETE SURFACES .
- ALL VISIBLE CONCRETE EDGES HAVE TO BE CHAMFERED 2 cm BY 2 cm . (see also typical Detail shown on this Drawing)

CONCRETE FINISHING WORKS

Finishes For Unformed Surfaces

U-CJ Finish ▽ – Surfaces of horizontal construction joints. The surface shall be scabbed (chiselled) and all loose material shall be removed. Before placing new concrete the surface shall be thoroughly cleaned with air and water jet to remove all laitance, scum and foreign matter.

U1 Finish ▽ – This finish applies to surfaces that will be covered by fill material. Finishing shall consist of sufficient levelling and screeding to produce even uniform surfaces.

U2 Finish ▽▽ –This finish applies to surfaces that will be covered by floor covering materials and to surfaces which will not be permanently exposed to view. Finishing shall consist of sufficient levelling and screedfng to produce even uniform surfaces.

U3 Finish ▽▽▽ –This finish applies to the concrete surfaces of exposed decks or slabs and for surfaces in contact with flowing water. Floating shall be performed by hand or power driven equipment to produce a dense, smooth uniform surface free of blemish, ripples and trowel marks.

Finishes For Formed Surfaces

F-CJ Finish ▼ – This finish is for vertical construction joint surfaces. Formwork may be sawn boards or other suitable material which will prevent the loss of fine material from the concrete being placed. After removal of the formwork the surface shall be scabbed (chiselled), honeycombs are to be removed completely. Before placing new concrete the surface shall be thoroughly cleaned with air and water jet.

F1 Finish ▼ –This finish is for surfaces which are concealed from view, including surfaces upon or against which backfill or concrete is to be placed and block-outs for equipment embedding or other parts which are to be built in. Formwork may be sawn boards. The surface shall be free from voids, honeycombs or other large blemishes.

F2 Finish ▼▼ –This finish is for surfaces which are permanently exposed to view, formed surfaces of expansion and contraction joints. Forms to provide a class F2 finish shall be faced with wrought tongued and grooved boards with square edges arranged in uniform pattern and close jointed or with suitable sheet material. Joints between boards or panels shall be horizontal and vertical.

F3 Finish ▼▼▼ –This finish is for surfaces which will be in contact with flowing water. The standard of finish required is similar to F2 finish, but with no surface bubbles or holes larger than 3mm diameter allowed, and with more stringent tolerance requirements.

TABLE OF SURFACE TOLERANCES

Specified Finish	Permissible Irregularities	
	Abrupt	Gradual
F-CJ, U-CJ	10 mm	20 mm
F1, U1	10 mm	10 mm
F2, U2	5 mm	10 mm
F3, U3		
Offset parallel to flow direction	5 mm	10 mm
Offset perpendicular to flow direction	3 mm	6 mm

TABLE OF CONCRETE CLASSES (ACC. TO M.O.U)

CONCRETE CLASS ACC. TO DIN 1045	max. AGGREGATE SIZE	APPLICATION
B15	25 mm	Blinding concrete
B25	50 mm	Mass concrete
B30	25 mm	Structural concrete for members smaller than 2 m thick
B30	19 mm	2nd stage concrete for cross-sectional areas ≤ 1.5 m2
B30	25 mm	2nd stage concrete for cross-sectional areas > 1.5 m2
B35	25 mm	Selected structural elements with higher stress
B35	19 mm	Pre-cast elements

EMBEDDED PARTS & MISCELLANEOUS METAL WORK

Symbols/explanations

101 No. of Embedded Part, to be supplied & installed by LOT1 Contractor

201 No. of Embedded Part, to be supplied by Lot2 Contractor and to be installed by LOT1 Contractor. If not otherwise indicated, the tolerances for the embed. parts are +/- 2cm in all directions

301 No. of Embedded Part, to be supplied by Lot3 Contractor and to be installed by LOT1 Contractor. If not otherwise indicated, the tolerances for the embed. parts are +/- 1.5cm in all directions

401 No. of Embedded Part, to be supplied by Lot4 Contractor and to be installed by LOT1 Contractor

List of Parts & Miscellaneous Metal Work

101 metal sheet waterstop 400mm/3mm, St 37

102 elastomer waterstop (DIN7865) "GUMBA FS 300R" or equivalent

103 elastomer waterstop (DIN7865) "GUMBA FM 320R" or equivalent

104 elastomer waterstop (DIN7865) "GUMBA FMS 500R-MSU" or equivalent (with closed cell foam rubber)

105 elastomer waterstop (DIN7865) "GUMBA FMS 500R" or equivalent

107 injection hose, "WEBAC" type 1, Pat.-Nr. 3507806 or equivalent for "WEBAC" 1403, 2-comp. PUR-resin injection

110 Sluiceway Piers, pressure steel door

111 Powerhouse, manhole at pressurized dewat. pump pit

112

113 steel gratings

114 checkered plate hatch covers

115 steel ladder (without safety cage)

116 steel ladder (with safety cage)

117 steel ladder (with anti-fall safety device)

118 handrails at platforms, El. 69.00/70.00

119 handrails at staircases and landings

120 Navigation Lock, monorail (lifting equipment for pump removal)

121 Powerhouse, monorail (lifting equipment for pump removal)

122 1 ton hook, St 37

125 Guard Tower/Public Road Bridge steel platform, El. 77.92

126 pipe/cable trench steel covers

130 Navigation Lock, edge protection, type A

131 Navigation Lock, edge protection, type B

132 Navigation Lock, edge protection, type C

133 Navigation Lock 2 – u/s Head, vertical steel sliding strip

134 Navigation Lock 1+2 – vertical steel sliding strip

135 Navigation Lock, recessed bollard

136 Navigation Lock, edge bollard

137

140 Navigation Lock, standard steel ladder

141 Navigation Lock, hand grip for standard steel ladder

142 Navigation Lock, recessed steel ladder

143 Navigation Lock, hand grip for recessed steel ladder

144 Navigation Lock, checkered plate hatch cover with hinge & arrester

145 Navigation Lock, end marking

150

155

160 Powerhouse El. 70.00, removable roof steel covers

170 pore pressure cells acc. to P.T.S. – Section 6

171 pore pressure cells, cable conduit

178 steel pipe DN50

179 steel pipe DN100

180 Drainage, cast iron pipe DN200

181 Drainage, cast iron pipe DN100

182 Drainage, cast iron pipe DN150

183 Drainage, PVC pipe DN50

184 Drainage, PVC pipe DN100

185 Drainage, PVC pipe DN150

186 Drainage, PVC pipe DN250

187 Navig. Locks, Filling/Emptying System dewatering pipe

188 Floor drain DN100

189 Floor drain DN150

190 Public Road Bridge, bridge drain DN150

191 Public Road Bridge, steel plate 470/470/60 base plate for hydr. jack

192 Main Gantry Crane Beam, steel plate 300/300/40 base plate for hydr. jack

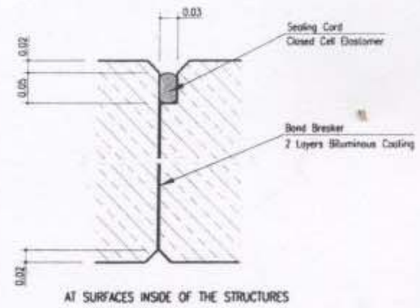
195

196 cable conduit DN40

197 cable conduit DN100

198 cable conduit DN150

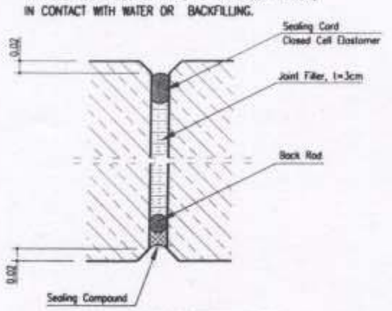
AT OUTER SURFACES PERMANENTLY EXPOSED TO VIEW, IN CONTACT WITH WATER OR BACKFILLING.



AT SURFACES INSIDE OF THE STRUCTURES

TYPICAL CONTRACTION JOINT FINISHING DETAIL

AT OUTER SURFACES PERMANENTLY EXPOSED TO VIEW, IN CONTACT WITH WATER OR BACKFILLING.



AT SURFACES INSIDE OF THE STRUCTURES

TYPICAL EXPANSION JOINT FINISHING DETAIL

APPROVED FOR CONSTRUCTION

REF. MWRI LETTER NO.: 2982/202 DATE: 29.10.03

rev.	description	drawn	checked	date
D	modified as indicated	Wa. Za.	ZANKE	30.03.0
C	Table of Concrete Classes modified.	Wa. Za.	ZANKE	06.03.0
B	approved by MWRI	Wa. Za.	ZANKE	30.11.0
	List of embedded parts updated.			
A	FIRST ISSUE	Wa. Za.	Zonke	22.09.0

NEW NAGA HAMMADI BARRAGE AND HYDROPOWER PLANT
PROJECT IMPLEMENTATION UNIT
MWRI – MEE

TASK B – CONSTRUCTION DESIGN

Naga Hammadi Barrage Development Consultants

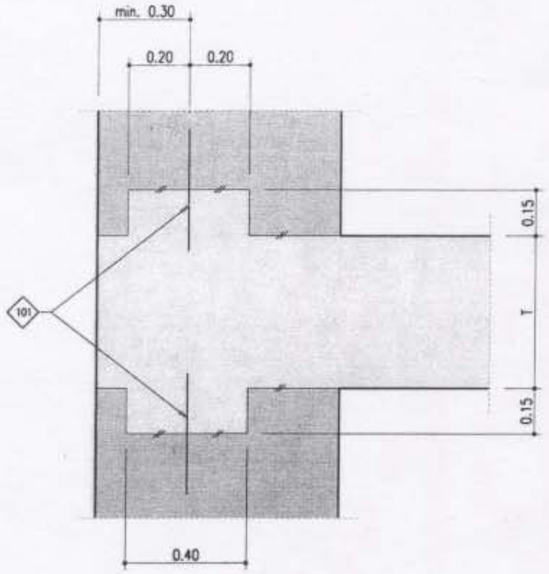
LAHMEYER INTERNATIONAL · ELECTROWATT-EKONO Joakko Poyry Group · SOGREAH

EMPLOYERS DRWG. NO.:

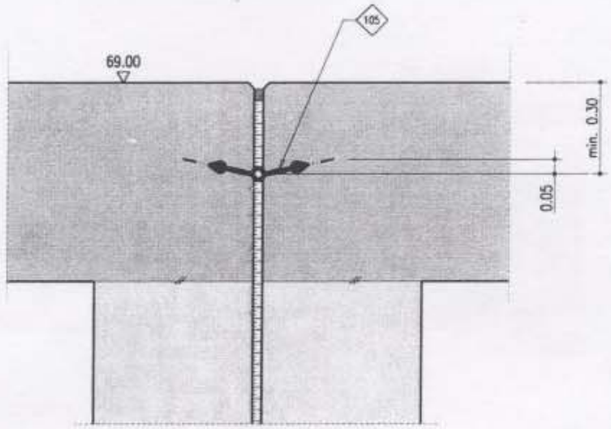
GENERAL NOTES

CONCRETE DIMENSION DRAWING

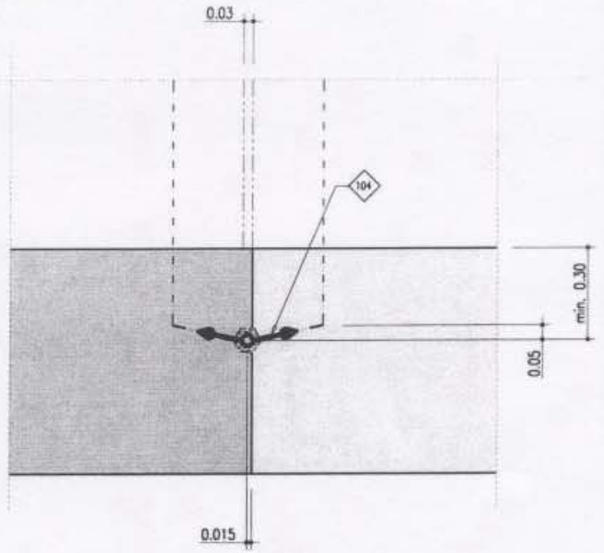
prepared:	Wa. Za.	20.02.03	SCALE: (A1)	DRWG. NO.:	REV.
checked:	Zonke	20.02.03		C-C C 00 2001	D
approved:	Dr Kotb	20.02.03			



VERTICAL SECTION
TYP. SITUATION: WALL/SLAB
HORIZ. CONSTR. JOINT



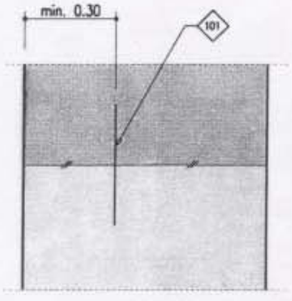
VERTICAL SECTION
TYP. SITUATION: SLAB
EXPANSION JOINT



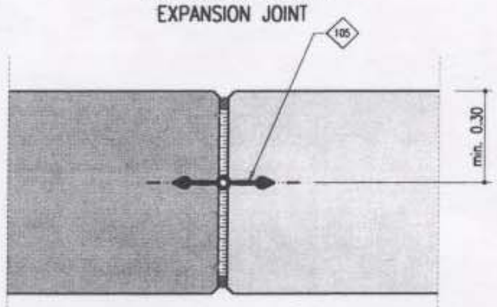
VERTICAL SECTION
TYP. SITUATION: SLAB/WALL
CONTRACTION/EXPANSION JOINT

EMBEDDED PARTS

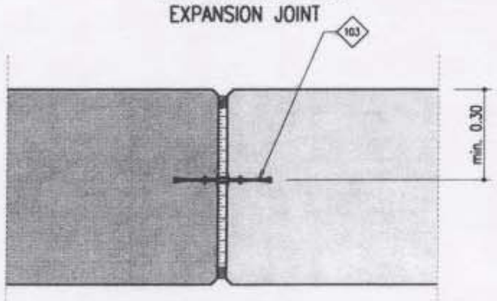
- 101 metal sheet waterstop 400mm/3mm, St 37
- 102 elastomer waterstop (DIN7865) "GUMBA FS 300R" or equivalent
- 103 elastomer waterstop (DIN7865) "GUMBA 2235RMD" or equivalent
- 104 elastomer waterstop (DIN7865) "GUMBA FMS 500R-MSU" or equivalent (with closed cell foam rubber)
- 105 elastomer waterstop (DIN7865) "GUMBA FMS 500R" or equivalent



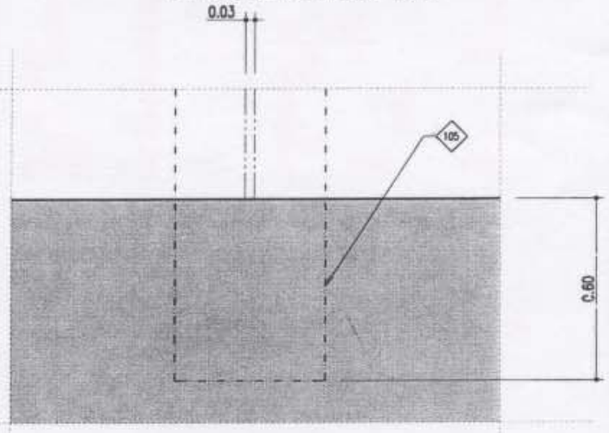
VERTICAL SECTION
TYP. SITUATION: WALL
HORIZ. CONSTR. JOINT



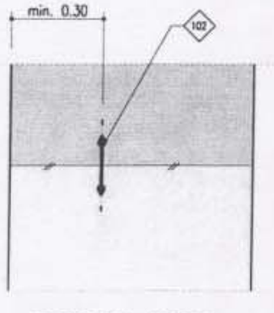
HORIZONTAL SECTION
TYP. SITUATION: WALL
EXPANSION JOINT



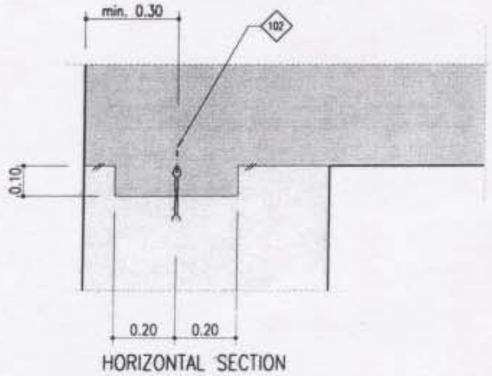
HORIZONTAL SECTION
TYP. SITUATION: RETAINING WALL
EXPANSION JOINT



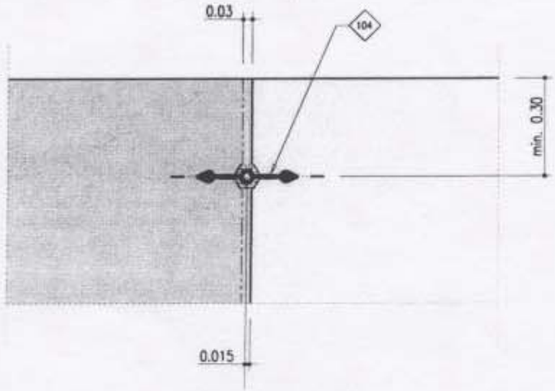
VERTICAL SECTION
TYP. SITUATION: SLAB/WALL
EXPANSION JOINT



HORIZONTAL SECTION
TYP. SITUATION: WALL
VERTICAL CONSTR. JOINT



HORIZONTAL SECTION
TYP. SITUATION: WALL
VERTICAL CONSTR. JOINT



HORIZONTAL SECTION
TYP. SITUATION: WALL
CONTRACTION JOINT

APPROVED FOR CONSTRUCTION
REF. MWRI LETTER NO.: 2982/202 DATE: 29.10.03

rev.	description	drawn	checked	date
A	Approved by MWRI	Selim	Zanke	30.11.03

NEW NAGA HAMMADI BARRAGE AND HYDROPOWER PLANT
PROJECT IMPLEMENTATION UNIT
MWRI – MEE

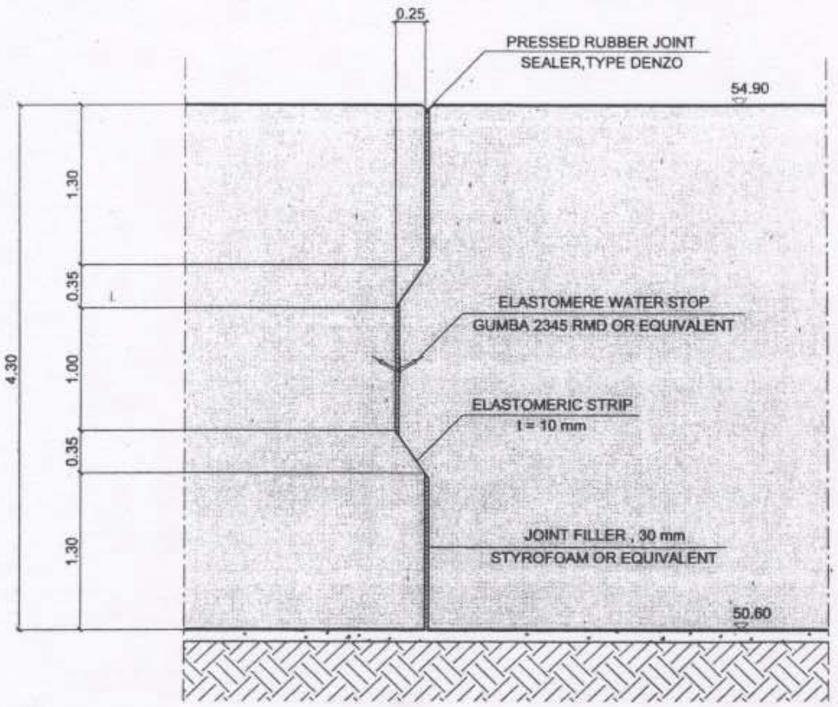
TASK 8 – CONSTRUCTION DESIGN

Naga Hammadi Barrage Development Consultants
LAHMEYER INTERNATIONAL · ELECTROWATT-EKONO Zaakko Pöyry Group · SOGREAH

EMPLOYERS DRWG. NO.:

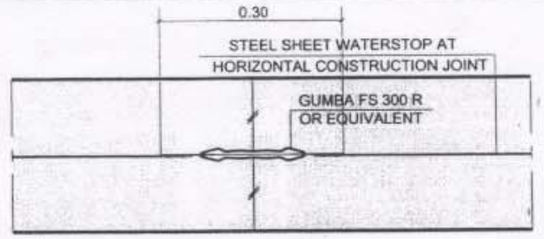
GENERAL
WATERSTOP DETAILS, EMBEDDED PART
Nos. 101, 102, 103, 104, 105

prepared:	Selim	01.07.03	SCALE: (A1)	DRWG. NO.		REV.
checked:	Zanke	01.07.03	1 : 10	C-C S 00 1805		A
approved:	Dr.Kohli	01.07.03				



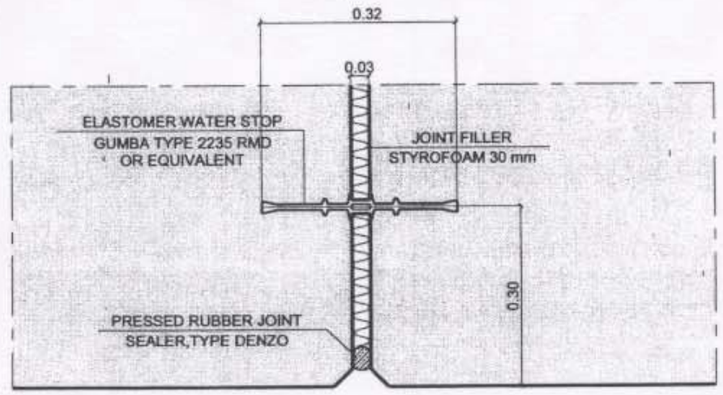
SHEAR KEY AT NAVIGATION LOCK BOTTOM SLAB

TYPICAL FOR ALL BOTTOM SLABS
SCALE 1/50



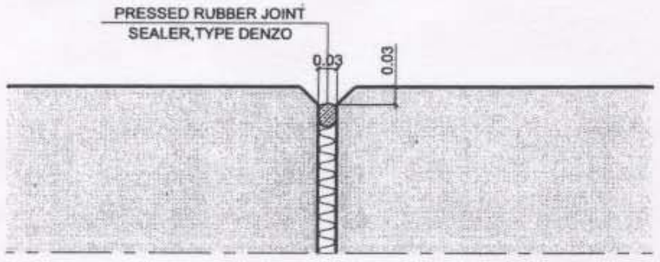
CONSTRUCTION JOINT DETAIL

TYPICAL FOR WATER STOP SEALED VERTICAL JOINT

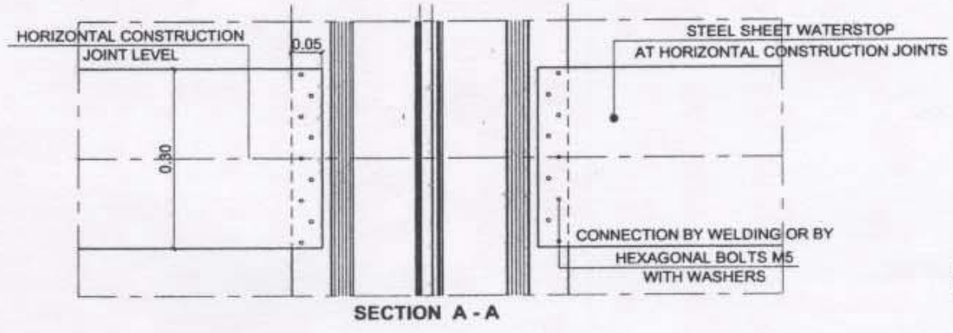


WATERSTOP TYPE II
EXPANSION JOINT DETAIL

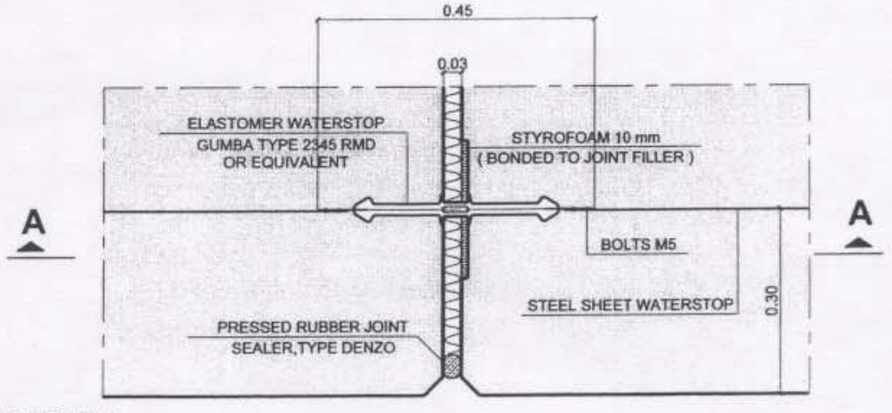
TYPICAL FOR RETAINING WALLS



TYPICAL SECTION IN SLABS



SECTION A - A



TYPICAL SECTION IN WALLS

WATERSTOP TYPE 1
EXPANSION JOINT DETAIL

TYPICAL FOR SLUICEWAY, NAV. LOCK
AND POWERHOUSE

SCALE
0 0.1 0.2 0.3 0.4 0.5 0.6m
(ORIG. SCALE : 1/10)

SCALE
0 0.5 1.0 1.5 2.0 2.5 3.0 m
(ORIG. SCALE : 1/50)

New Naga Hammadi Barrage and Hydropower Plant
Project Implementation Unit
MWRI - MEE

TENDER DESIGN

Naga Hammadi Barrage Development Consultants

SOGREAH

KAPZINSKY 2000

STANDARD DETAILS

WATER STOPS

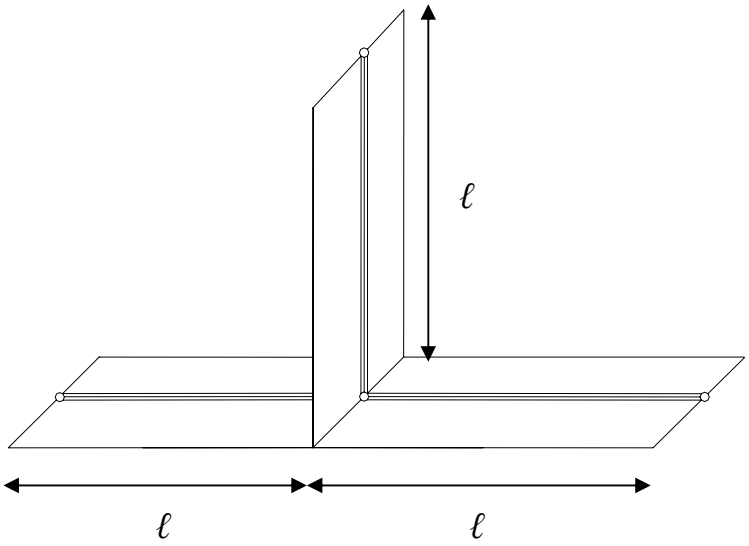
C 20-01

NHB_ENC1\H:\Drawings\Tender\20 Details\C 20-01

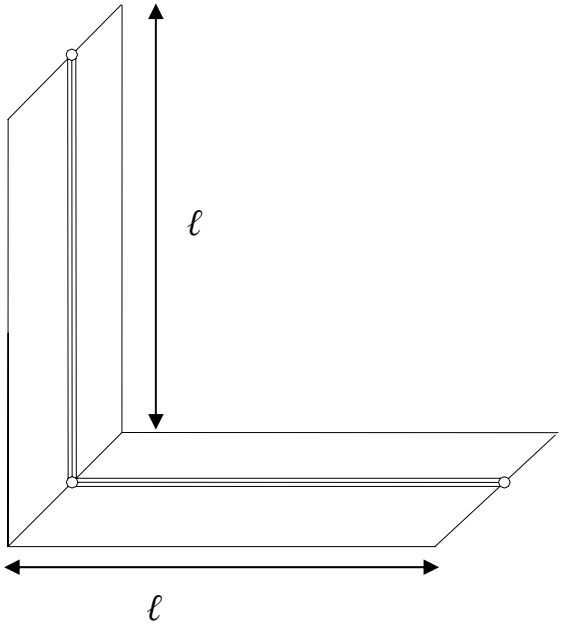
Appendix 4 - Junctions for Elastomer (rubber) Waterstops

102 - JUNCTIONS

102 - VERTICAL T



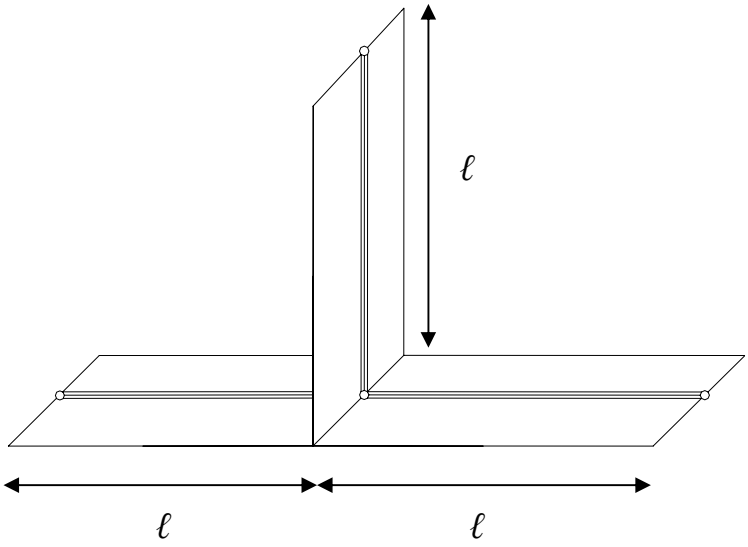
102 - VERTICAL EDGE



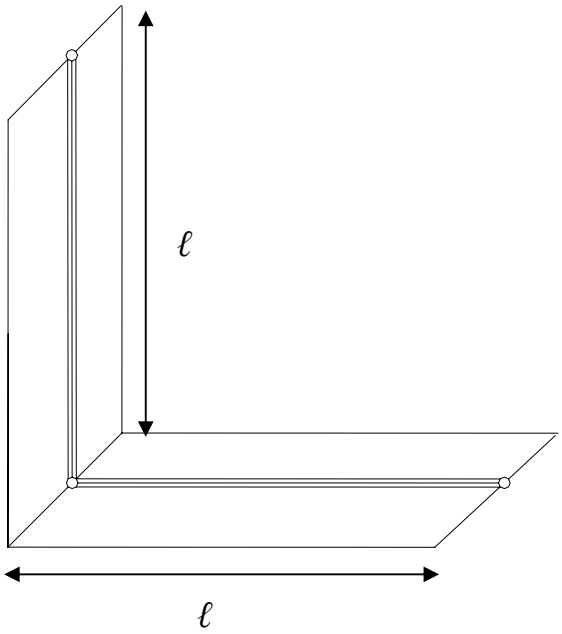
(Length ℓ : according manufacturer recommendations)

104 - JUNCTIONS

104 - VERTICAL T

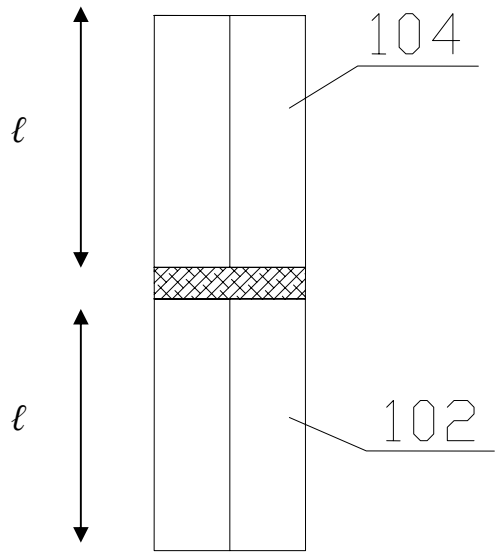


104 - VERTICAL EDGE



(Length ℓ : according manufacturer recommendations)

JUNCTIONS 102 - 104

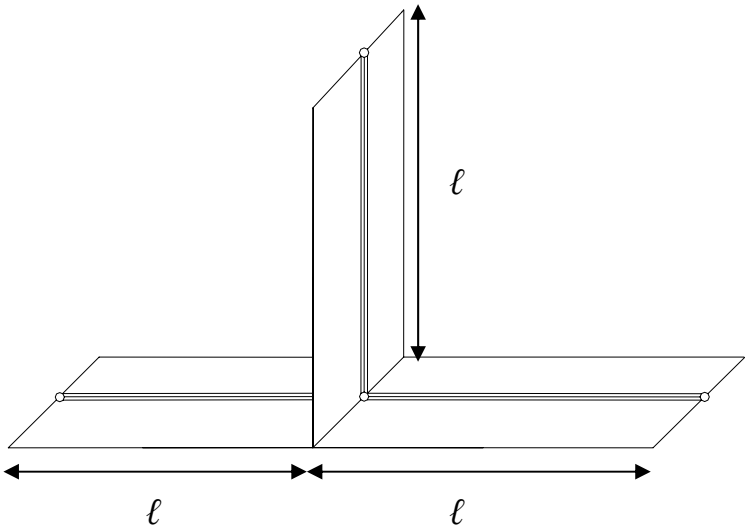


102 - 104 Transition

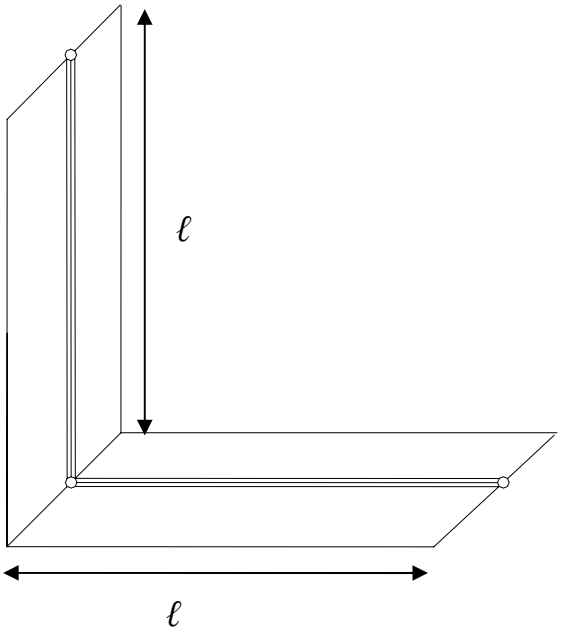
(Length ℓ : according manufacturer recommendations)

105 - JUNCTIONS

105 - VERTICAL T

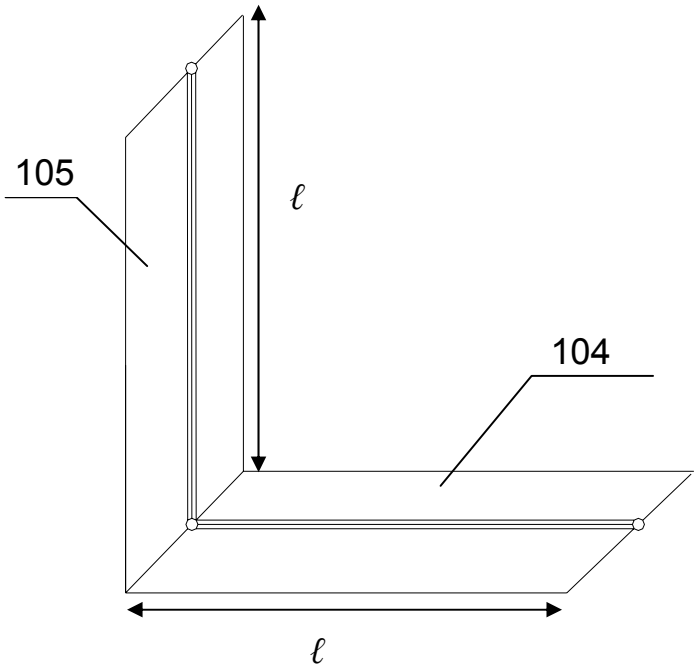


105 - VERTICAL EDGE

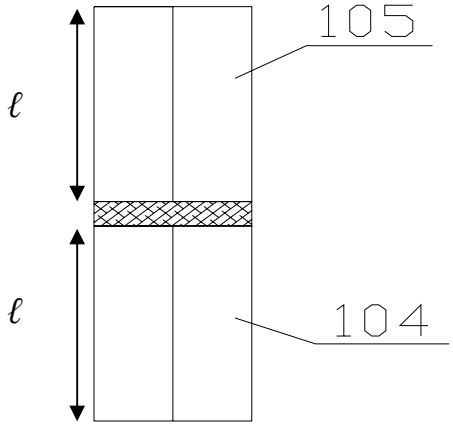


(Length ℓ : according manufacturer recommendations)

JUNCTIONS 104 - 105



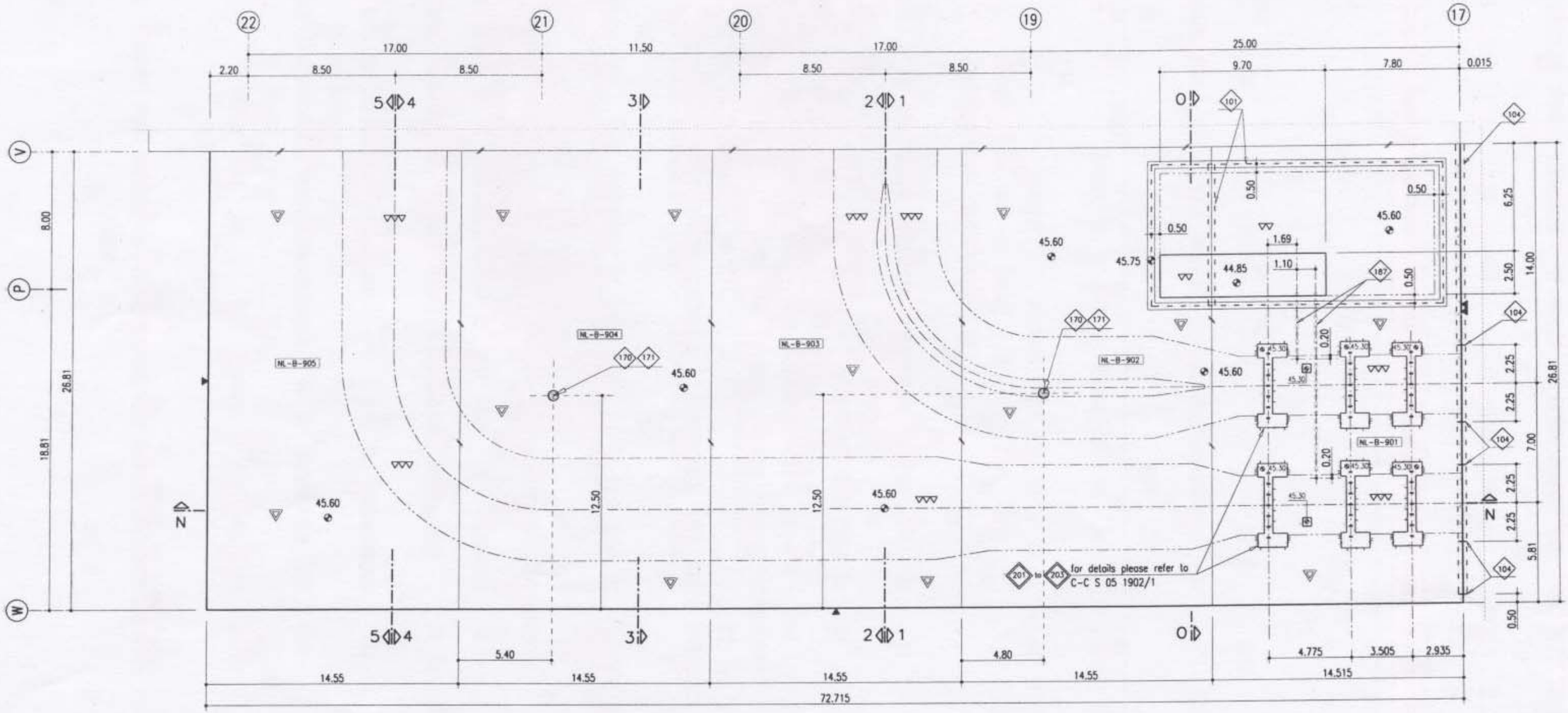
104 - 105 VERTICAL EDGE



104 - 105 Transition

(Length ℓ : according manufacturer recommendations)

Appendix 5 - Construction Drawings



LEGEND

NL-B-901 Coding No. of Concrete Blocks

INSTRUCTION

Nominal Class of Concrete: B 25

Finishes for Unformed Surfaces	Finishes for Formed Surfaces
U-CJ Finish	F-CJ Finish
U1 Finish	F1 Finish
U2 Finish	F2 Finish
U3 Finish	F3 Finish

EMBEDDED PARTS

101 metal sheet waterstop 400mm/3mm, St 37

104 elastomer waterstop (DIN7865) "DUMBA FWS 500R-MSU" or equivalent (with closed cell foam rubber)

170 pore pressure cells acc. to P.T.S. – Section 6

171 pore pressure cells, cable conduit

187 Navig. Locks, Filling/Emptying System dewatering pipe

203 No. of Embedded Part, to be supplied by Lot2 Contractor and to be installed by LOT1 Contractor

COMPLEMENTARY DRAWINGS

C-C C 05 2620	NAVIGATION LOCKS, AXIS S-T, PLAN El. 45.60
C-C C 05 2756	NAVIGATION LOCKS, SECTION M-M, N-N
C-C S 05 1902/1	CULVERT GATE & STOPLOGS, EMBEDDED PARTS 1st STAGE CONCRETE
C-C S 05 1904/1	CULVERT GATE & STOPLOGS, EMBEDDED PARTS 2nd STAGE CONCRETE
C-C S 00 1805	WATERSTOP DETAILS, EMB. PART Nos. 101 TO 105

APPROVED FOR CONSTRUCTION

REF. MWRI LETTER NO.: 441/202 DATE: 28.02.2004

rev.	description	drawn	checked	date
B	approved by MWRI	No. Za.	ZANKI	07.03.04
A	FIRST ISSUE	No. Za.	ZANKI	30.11.03

NEW NAGA HAMMADI BARRAGE AND HYDROPOWER PLANT PROJECT IMPLEMENTATION UNIT
MWRI – MEE

TASK 8 – CONSTRUCTION DESIGN

Naga Hammadi Barrage Development Consultants

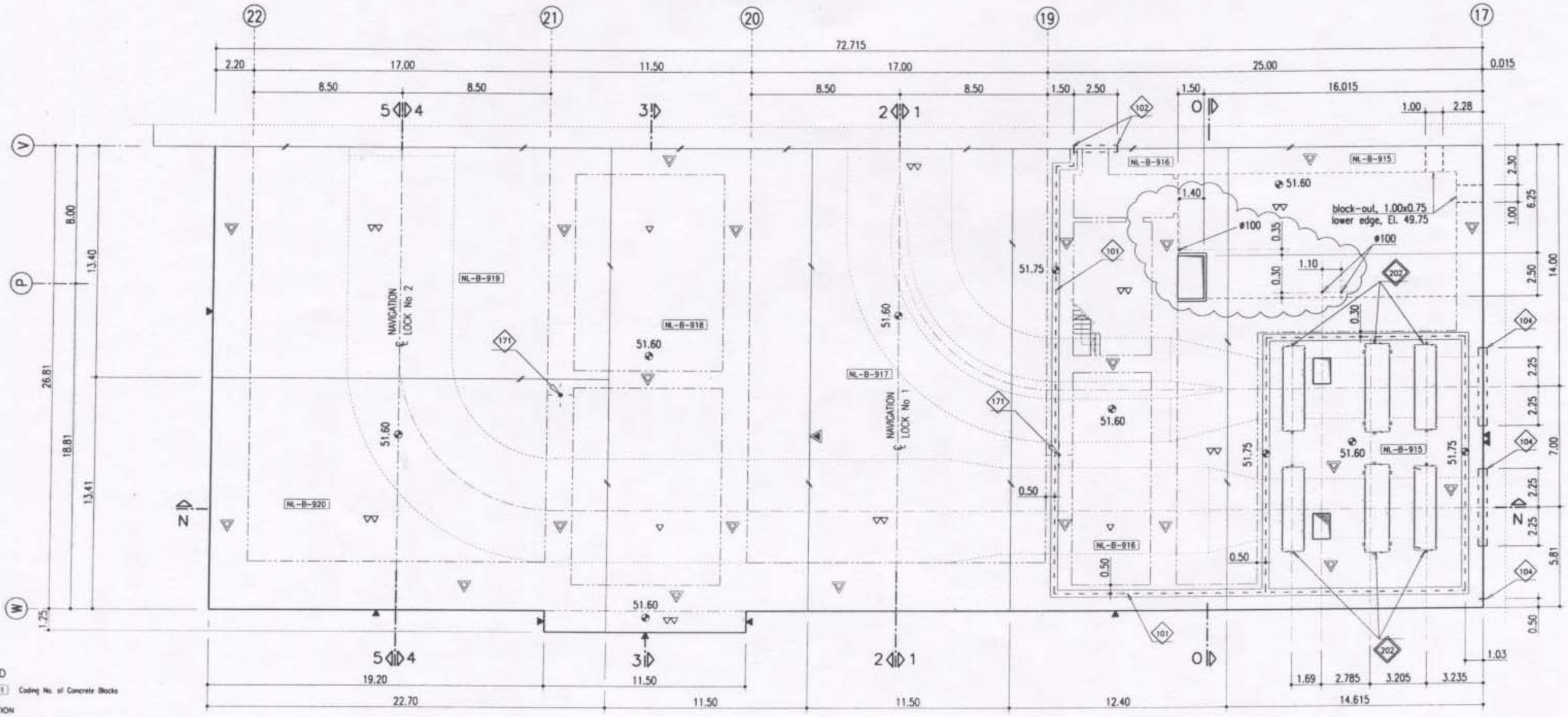
LAHMEYER INTERNATIONAL ELECTROWATT-EKONO Joakko Pöyry Group SOGREAH

EMPLOYERS DRWG. NO.:

NAVIGATION LOCK
AXIS V TO AXIS W
PLAN AT El. 45.60

CONCRETE DIMENSION DRAWINGS

prepared	Smevis	11.06.03	SCALE: (A1)	1 : 125	C-C	C	05	2622
checked	Zanki	11.06.03						
approved	Dr.Kahl	11.06.03						



LEGEND

NL-B-601 Coding No. of Concrete Blocks

INSTRUCTION

Nominal Class of Concrete: B 25

Finishes for Unformed Surfaces

- U-CJ Finish
- U1 Finish
- U2 Finish
- U3 Finish

Finishes for Formed Surfaces

- F-CJ Finish
- F1 Finish
- F2 Finish
- F3 Finish

EMBEDDED PARTS

- 101 metal sheet waterstop 400mm/3mm, St 37
- 102 elastomer waterstop (DIN7865) "GUMBA FS 300R" or equivalent
- elastomer waterstop (DIN7865) "GUMBA FWS 500R-MSU" or equivalent (with closed cell foam rubber)
- 171 pore pressure cells, cable conduit
- 201 No. of Embedded Part, to be supplied by Lot2 Contractor and to be installed by LOT1 Contractor

COMPLEMENTARY DRAWINGS

C-C C 05 2629	NAVIGATION LOCKS, AXIS S-T, PLAN El. 51.60
C-C C 05 2756	NAVIGATION LOCKS, SECTION M-M, N-N
C-C S 05 1902/1	CULVERT GATE & STOPLOGS, EMBEDDED PARTS 1st STAGE CONCRETE
C-C S 05 1904/1	CULVERT GATE & STOPLOGS, EMBEDDED PARTS 2nd STAGE CONCRETE
C-C S 00 1805	WATERSTOP DETAILS, EMB. PART Nos. 101 TO 105

APPROVED FOR CONSTRUCTION

REF. MWRI LETTER NO. 441/202 DATE: 28.02.2004

B	approved by MWRI modified as indicated	No. Za.	ZANKE	07.03.04
A	FIRST ISSUE	No. Za.	ZANKE	30.11.03

NEW NAGA HAMMADI BARRAGE AND HYDROPOWER PLANT
PROJECT IMPLEMENTATION UNIT
MWRI - MEE

TASK B - CONSTRUCTION DESIGN

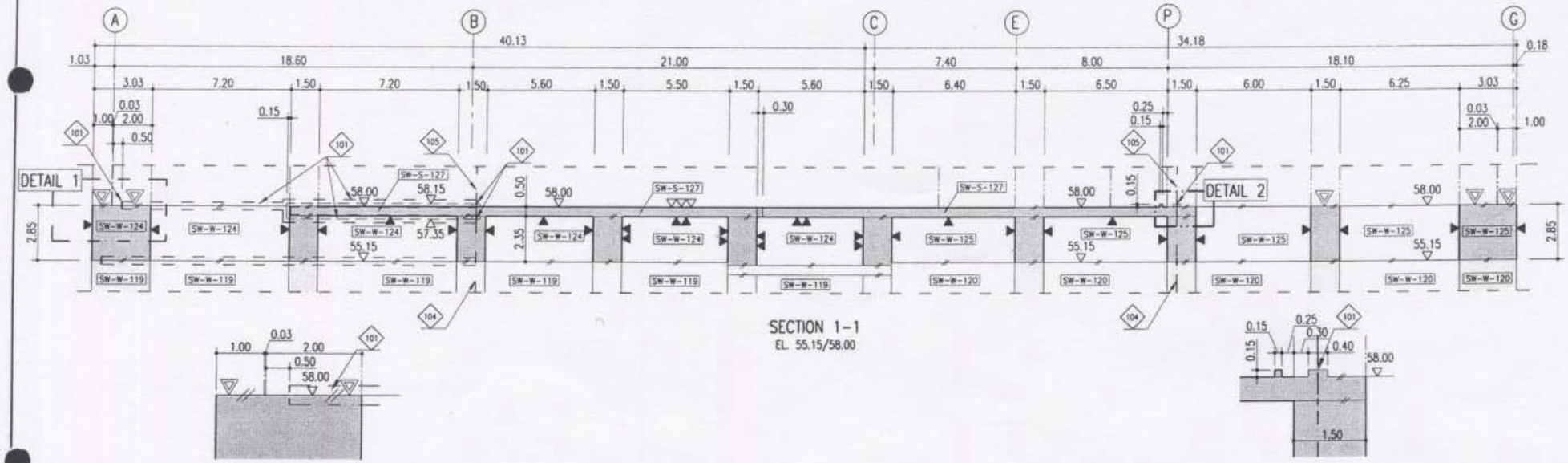
Naga Hammadi Barrage Development Consultants

ELECTROWATT-EKONO Joakim Piaty Group SOGREAH

EMPLOYER'S DRWG. NO.

NAVIGATION LOCK
AXIS V TO AXIS W
PLAN AT El. 51.60

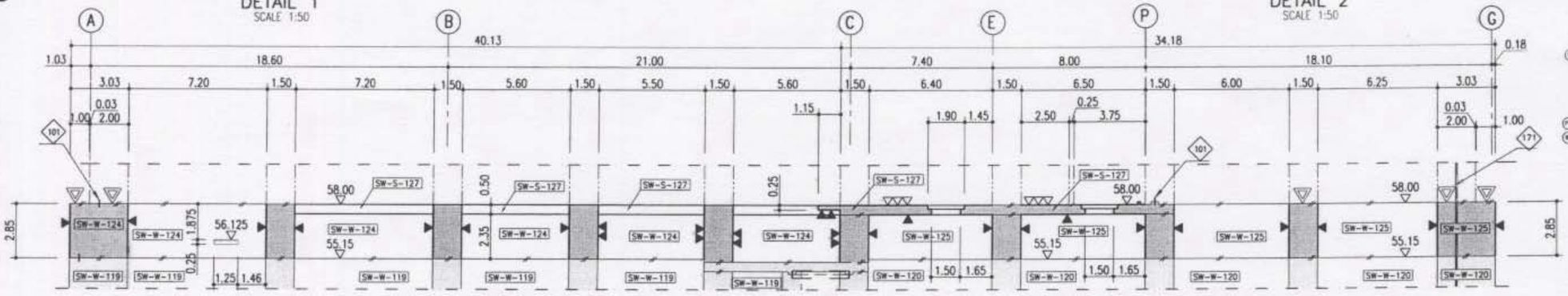
C-C C 05 2631 B



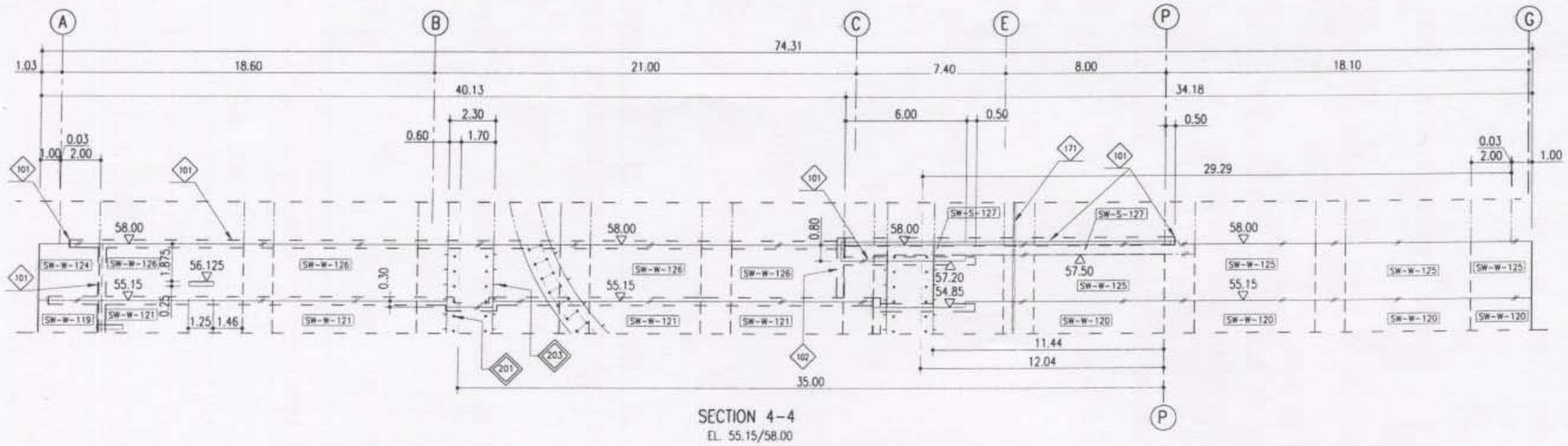
SECTION 1-1
EL. 55.15/58.00

DETAIL 1
SCALE 1:50

DETAIL 2
SCALE 1:50



SECTION 2-2
EL. 55.15/58.00



SECTION 4-4
EL. 55.15/58.00

LEGEND

SW-B-101 Coding No. of Concrete Blocks

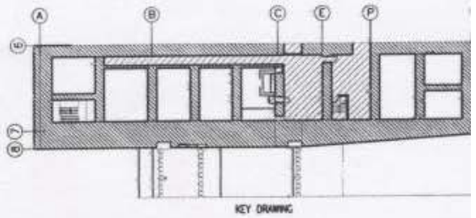
INSTRUCTION
Nominal Class of Concrete: B 25

Finishes for Unformed Surfaces
- U-CJ Finish
- U1 Finish
- U2 Finish
- U3 Finish

Finishes for Formed Surfaces
- F-CJ Finish
- F1 Finish
- F2 Finish
- F3 Finish

EMBEDDED PARTS
- 101 Metal sheet waterstop 400mm/3mm, St 37
- 102 Elastomer waterstop (DIN7865) "GUMBA FS 300R" or equivalent
- 104 elastomer waterstop (DIN7865) "GUMBA FMS 500R-MSU" or equivalent (with closed cell foam rubber)
- 105 elastomer waterstop (DIN7865) "GUMBA FMS 500R" or equivalent
- 171 Pore pressure cells, cable conduits
- 201 STEEL PLATE, TYPE A
- 202 STEEL PLATE, TYPE B
- 203 STEEL PLATE, TYPE C

COMPLEMENTARY DRAWINGS
C-C C 04 2413 SLUICEWAY, INTERMEDIATE PIER, AXES A-G/6-8, PLANS, EL.58.00
C-C C 04 2415 SLUICEWAY, INTERMEDIATE PIER, AXES A-G/6-8, EL. 55.15 TO 58.00, SECTION



approval stamp:

APPROVED FOR CONSTRUCTION

REF. MWRI LETTER NO.: 193/202 DATE: 24.01.04

rev.	description	drawn	checked	date
A	Approved by MWRI	Mrsic	Zanke	18.02.04

NEW NAGA HAMMADI BARRAGE AND HYDROPOWER PLANT
PROJECT IMPLEMENTATION UNIT
MWRI - MEE

TASK B - CONSTRUCTION DESIGN

Naga Hammadi Barrage Development Consultants

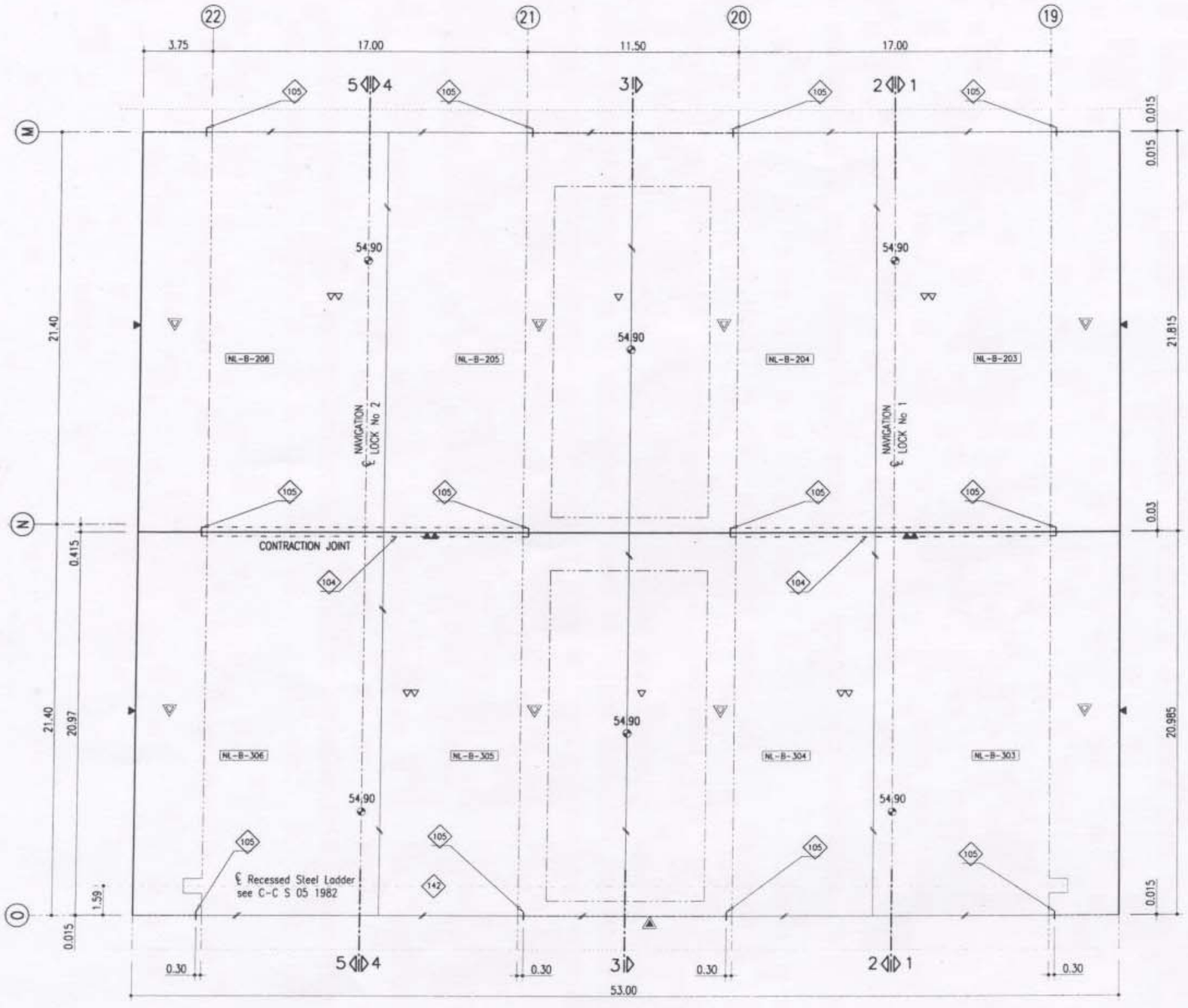
LAHMEYER INTERNATIONAL ELECTROWATT-EKONO Zaklko Pöyry Group SOGREAH

EMPLOYERS DRWG. NO.:

SLUICEWAY
INTERMEDIATE PIER
AXES A-G/6-8, EL. 55.15 TO 58.00
SECTIONS

CONCRETE DIMENSION DRAWING

prepared	Mrsic	04.03.03	SCALE: (A1)	DRWG. NO.		REV.
checked	Zanke	04.03.03	1 : 125	C-C	C 04 2414	A
approved	Dr Kothi	04.03.03				



LEGEND

NL-B-203 Coding No. of Concrete Blocks

INSTRUCTION

Nominal Class of Concrete: B 25

Finishes for Unformed Surfaces	Finishes for Formed Surfaces
U-CJ Finish	
U1 Finish	
U2 Finish	
U3 Finish	

EMBEDDED PARTS

104 elastomer waterstop (DIN7865) "DUMBA FWS 500R-MSU" or equivalent (with closed cell foam rubber)

105 elastomer waterstop (DIN7865) "DUMBA FWS 500R-MSU" or equivalent

COMPLEMENTARY DRAWINGS

C-C C 05 2660 NAVIGATION LOCKS, AXIS K-M, PLAN EL 54.90
C-C C 05 2662 NAVIGATION LOCKS, AXIS O-S, PLAN EL 54.90
C-C C 05 2753 NAVIGATION LOCKS, SECTION G-G, H-H

APPROVED FOR CONSTRUCTION

REF. MWRI LETTER NO.: 441/202 DATE: 28.02.2004

rev.	description	drawn	checked	date
B	approved by MWRI	Mo. Za.	ZANKE	07.03.04
A	FIRST ISSUE	Mo. Za.	ZANKE	30.11.03

NEW NAGA HAMMADI BARRAGE AND HYDROPOWER PLANT
PROJECT IMPLEMENTATION UNIT
MWRI - MEE

TASK B - CONSTRUCTION DESIGN

Naga Hammadi Barrage Development Consultants

LAHMEYER INTERNATIONAL · ELECTROWATT-EKONO Joakko Poyry Group · SOGREAH

EMPLOYERS DRWG. NO.:

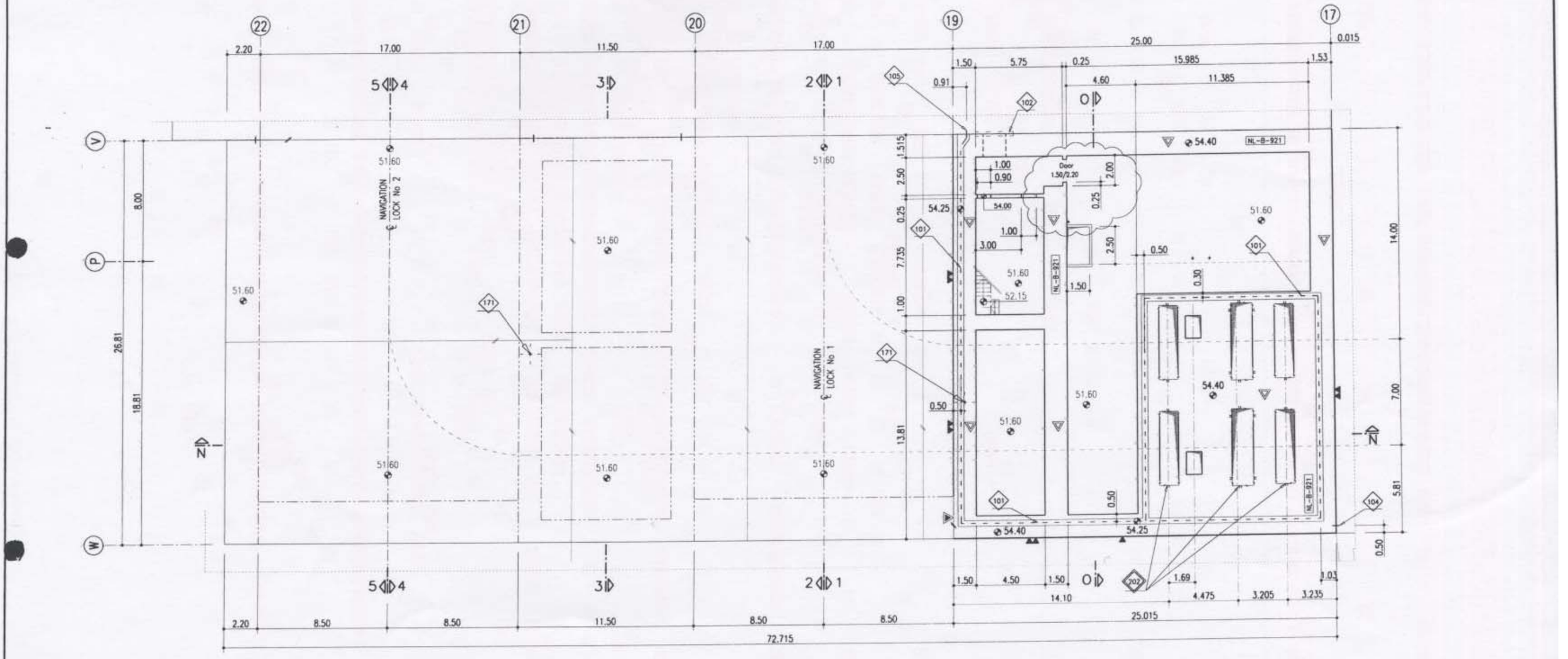
NAVIGATION LOCK

AXIS M TO AXIS O

PLAN AT EL. 54.90

CONSULTANTS DRAWING

prepared	Simone	16.06.03	SCALE: (A1)	1:25	DRWG. NO. C-C C 05 2661	REV. B
checked	Ophee	16.06.03				
approved	Dr.Kalb	16.06.03				



LEGEND

NL-B-921 Coding No. of Concrete Blocks

INSTRUCTION

Nominal Class of Concrete: B 25

Finishes for Unformed Surfaces		Finishes for Formed Surfaces	
U-CJ Finish		F-CJ Finish	
U1 Finish		F1 Finish	
U2 Finish		F2 Finish	
U3 Finish		F3 Finish	

EMBEDDED PARTS

- 101 metal sheet waterstop 400mm/3mm, St 37
- 102 elastomer waterstop (DIN7865) "GUMBA FS 300R" or equivalent
- 105 elastomer waterstop (DIN7865) "GUMBA FMS 500R-MSU" or equivalent
- 171 pore pressure cells, cable conduit
- 201 No. of Embedded Part, to be supplied by Lot2 Contractor and to be installed by LOT1 Contractor

COMPLEMENTARY DRAWINGS

C-C C 05 2663 NAVIGATION LOCKS, AXIS S-T, PLAN El. 54.90
C-C C 05 2756 NAVIGATION LOCKS, SECTION W-M, N-N
C-C S 05 1902/1 CULVERT GATE STOPLOGS, EMBEDDED PARTS 1st STAGE CONCRETE
C-C S 05 1904/1 CULVERT GATE STOPLOGS, EMBEDDED PARTS 2nd STAGE CONCRETE
C-C S 00 1805 WATERSTOP DETAILS, EMB. PART Nos. 101 TO 105

APPROVED FOR CONSTRUCTION

REF. MWRI LETTER NO. 441/202 DATE: 28.02.2004

C	modified as indicated	Wo. Za.	ZANKI	10.03.04
B	approved by MWRI	Wo. Za.	ZANKI	07.03.04
A	FIRST ISSUE	Wo. Za.	ZANKI	30.11.03

NEW NAGA HAMMADI BARRAGE AND HYDROPOWER PLANT
PROJECT IMPLEMENTATION UNIT
MWRI – MEE

TASK B – CONSTRUCTION DESIGN

Naga Hammadi Barrage Development Consultants

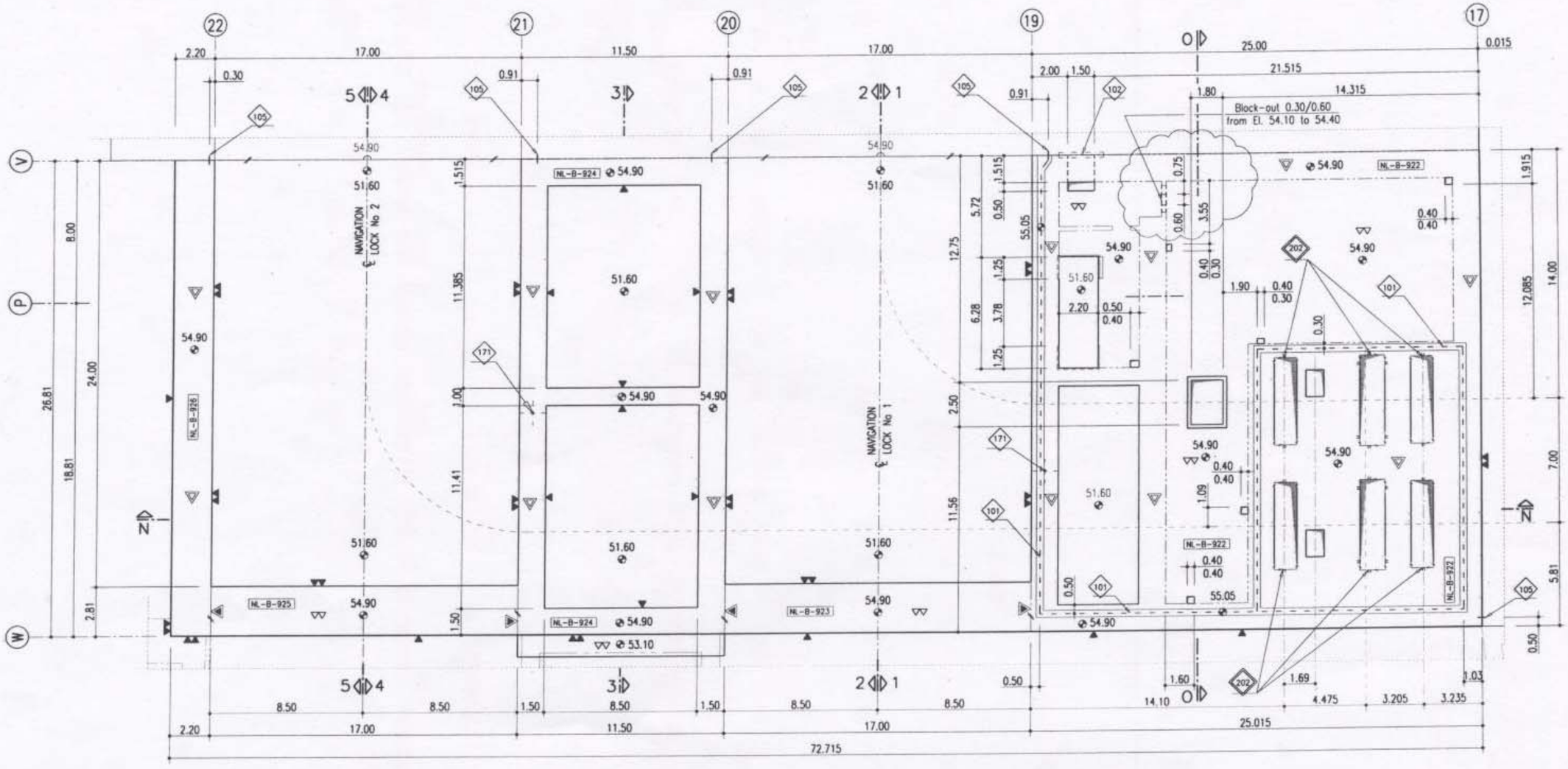
ELECTROWATT-EKONO Zublin Poyry Group SOGREAH

EMPLOYERS DRWG. NO.:

NAVIGATION LOCK
AXIS V TO AXIS W
PLAN AT El. 54.40
SHEET 1 OF 2

CONCRETE DIMENSION DRAWING

prepared: Tarabia 14.08.03 SCALE: 1:1 DRWG. NO.:
checked: Zanki 14.08.03 1:25 C-C C 05 2665/1 C
approved: El Ruby 14.08.03



EGEND

NL-B-922 Coding No. of Concrete Blocks

STRUCTION

ominal Class of Concrete: B 25

Finishes for Unformed Surfaces	Finishes for Formed Surfaces
U-CJ Finish	F-CJ Finish
U1 Finish	F1 Finish
U2 Finish	F2 Finish
U3 Finish	F3 Finish

MBEDDED PARTS

101 metal sheet waterstop 400mm/3mm, St 37

105 elastomer waterstop (DIN7865) "GUMBA FMS 500R-MSU" or equivalent

171 pore pressure cells, cable conduit

201 No. of Embedded Part, to be supplied by Lot2 Contractor and to be installed by Lot1 Contractor

COMPLEMENTARY DRAWINGS

C-C C 05 2663 NAVIGATION LOCKS, AXIS S-T, PLAN El. 54.90
C-C C 05 2756 NAVIGATION LOCKS, SECTION M-M, N-N
C-C S 05 1902/1 CULVERT GATE STOPLOGS, EMBEDDED PARTS 1st STAGE CONCRETE
C-C S 05 1904/1 CULVERT GATE STOPLOGS, EMBEDDED PARTS 2nd STAGE CONCRETE
C-C S 00 1805 WATERSTOP DETAILS, EMB. PART Nos. 101 TO 105

APPROVED FOR CONSTRUCTION

REF. MWRI LETTER NO. 441/202 DATE 26.02.2004

C	modified as indicated	No. Za.	ZANKE	10.03.04
B	approved by MWRI	No. Za.	ZANKE	07.03.04
A	FIRST ISSUE	No. Za.	ZANKE	30.11.03

NEW NAGA HAMMADI BARRAGE AND HYDROPOWER PLANT
PROJECT IMPLEMENTATION UNIT
MWRI – MEE

TASK B – CONSTRUCTION DESIGN

Naga Hammadi Barrage Development Consultants

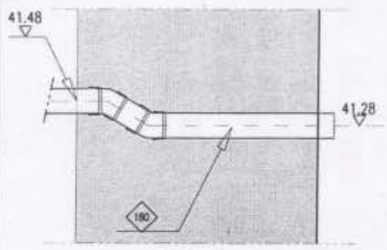
ACE LAHMEYER INTERNATIONAL ELECTROWATT-EKONO Jaakko Pöyry Group SOGREAH

EMPLOYERS DRWG. NO.

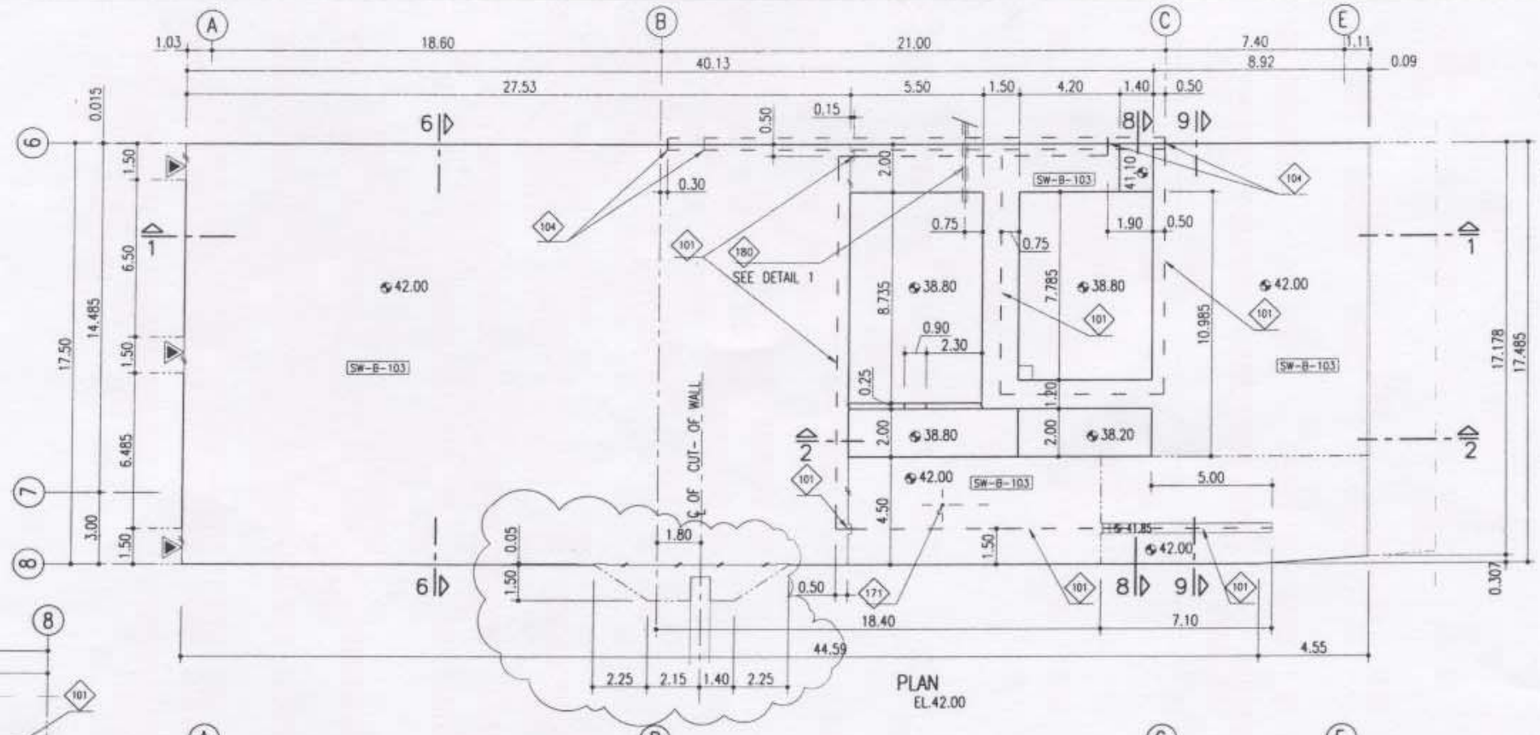
NAVIGATION LOCK
AXIS V TO AXIS W
PLAN AT El. 54.90
SHEET 2 OF 2

CONCRETE DIMENSION DRAWING

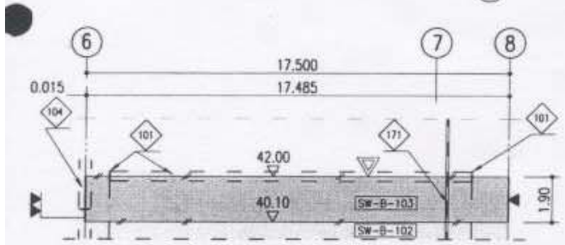
prepared	Smaltz	14.08.03	SCALE 1:100	DRWG. NO.	C-C C 05 2665/2	REV.	C
checked	Zahn	14.08.03					
approved	Dr.Kalla	14.08.03					



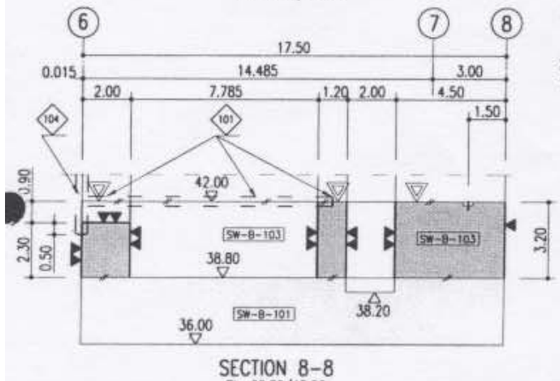
DETAIL 1
SCALE 1:25



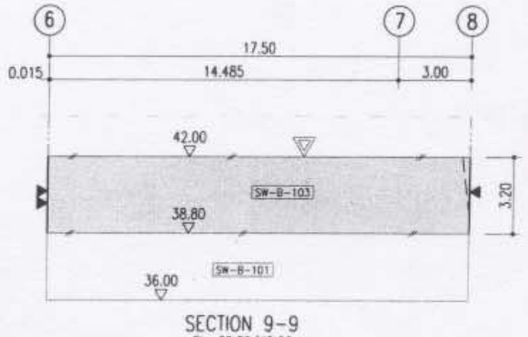
PLAN
EL.42.00



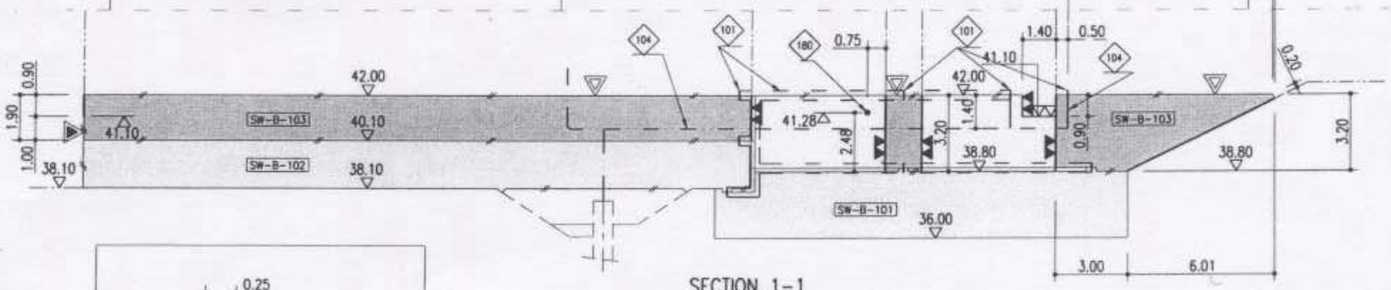
SECTION 6-6
EL. 40.10/42.00



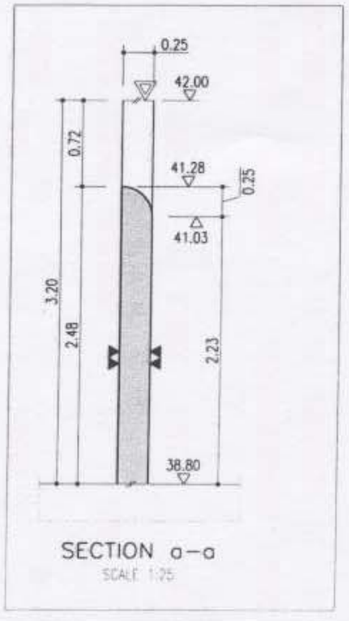
SECTION 8-8
EL. 38.80/42.00



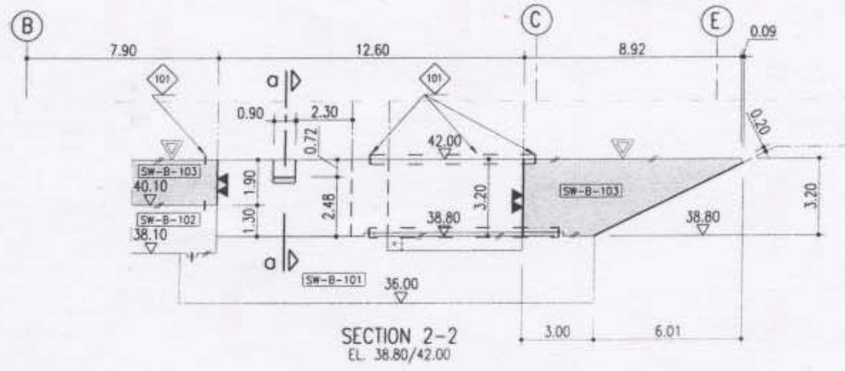
SECTION 9-9
EL. 38.80/42.00



SECTION 1-1
EL. 38.80/42.00



SECTION a-a
SCALE 1:25



SECTION 2-2
EL. 38.80/42.00

LEGEND

SW-B-103 Coding No. of Concrete Blocks

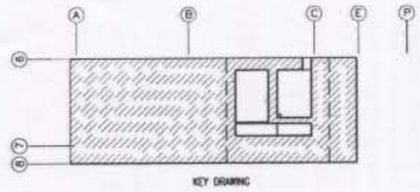
INSTRUCTION
Nominal Class of Concrete: B 25

Finishes for Unformed Surfaces
- U-CJ Finish
- U1 Finish
- U2 Finish
- U3 Finish

Finishes for Formed Surfaces
- F-CJ Finish
- F1 Finish
- F2 Finish
- F3 Finish

EMBEDDED PARTS
- 101 Metal sheet waterstop 400mm/3mm, St 37
- 104 elastomer waterstop (DIN7865) "GUMBA FWS 500R-W5U" or equivalent (with closed cell foam rubber)
- 171 Pore pressure cells, cable conduits
- 180 Drainage , Cast Iron Pipe DN200

REFERENCE DRAWINGS
- C-C P 03 1301 POWERHOUSE, AXES 1-8/A-G, PLAN, EL.41.10
- C-C P 03 1302 POWERHOUSE, AXES 6-8/B-E, PLANS, EL. 41.10 & 43.20
- C-C C 00 2001 GENERAL NOTES
- C-C C 03 2400 SLUICEWAY, INTERMEDIATE PIER, AXES B-C/6-8, EL.36.00 TO 38.80 PLAN EL.38.80 AND SECTIONS
- C-C C 03 2401 SLUICEWAY, INTERMEDIATE PIER, AXES B-C/6-8, EL.36.00 TO 40.10 PLAN EL.40.10 AND SECTIONS



KEY DRAWING

approval stamp:

APPROVED FOR CONSTRUCTION

REF. MWRI LETTER NO.: 193/202 DATE: 24.01.04

rev.	description	drawn	checked	date
A	Approved by MWRI	Mrsic	Zonke	18.02.04
	As indicated			

NEW NAGA HAMMADI BARRAGE AND HYDROPOWER PLANT
PROJECT IMPLEMENTATION UNIT
MWRI - MEE

TASK 8 - CONSTRUCTION DESIGN

Naga Hammadi Barrage Development Consultants

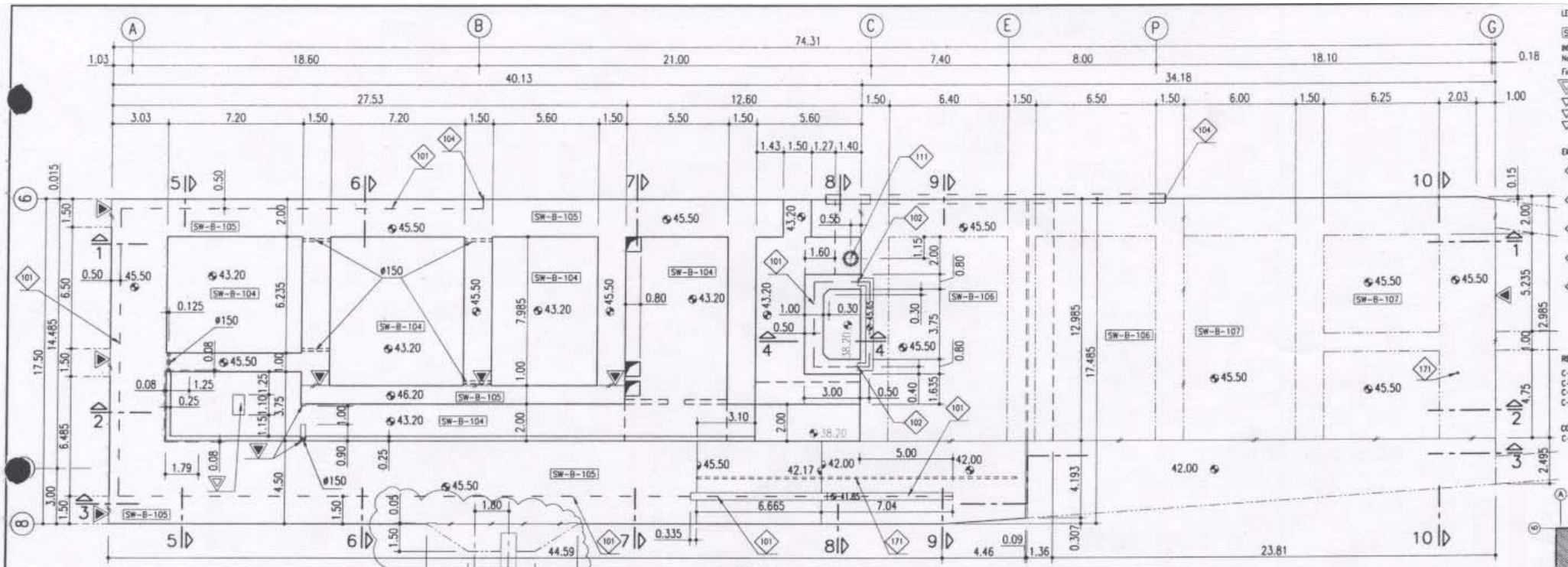
LAHMEYER INTERNATIONAL · ELECTROWATT-EKONO Joakko Pöyry Group · SOGREAH

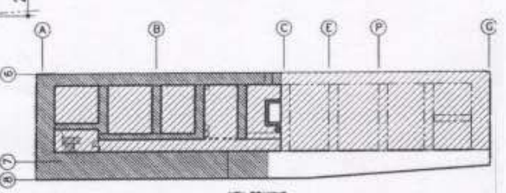
EMPLOYERS DRWG. NO.:

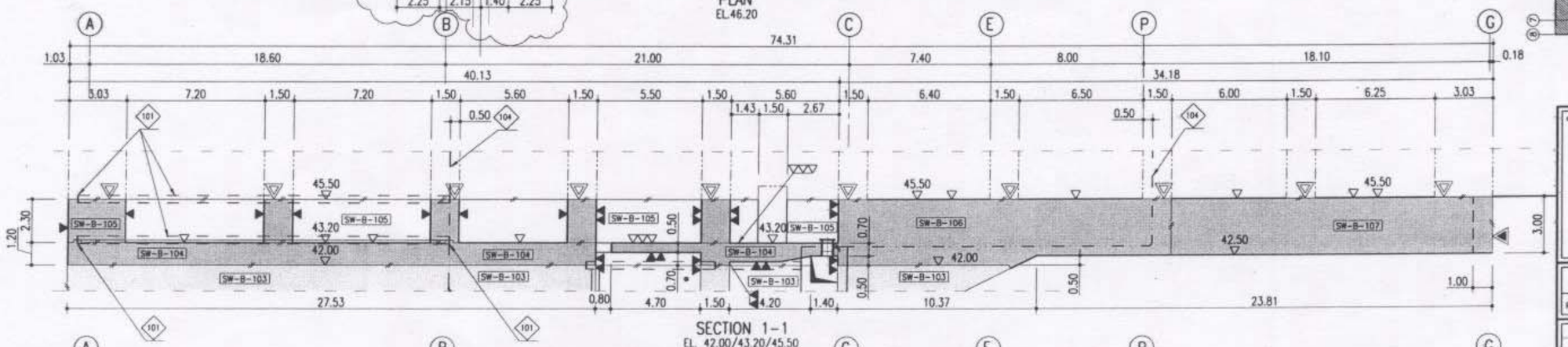
SLUICEWAY
INTERMEDIATE PIER
AXES A-E/6-8, EL. 38.20 TO 42.00
PLAN,EL.42.00 AND SECTIONS

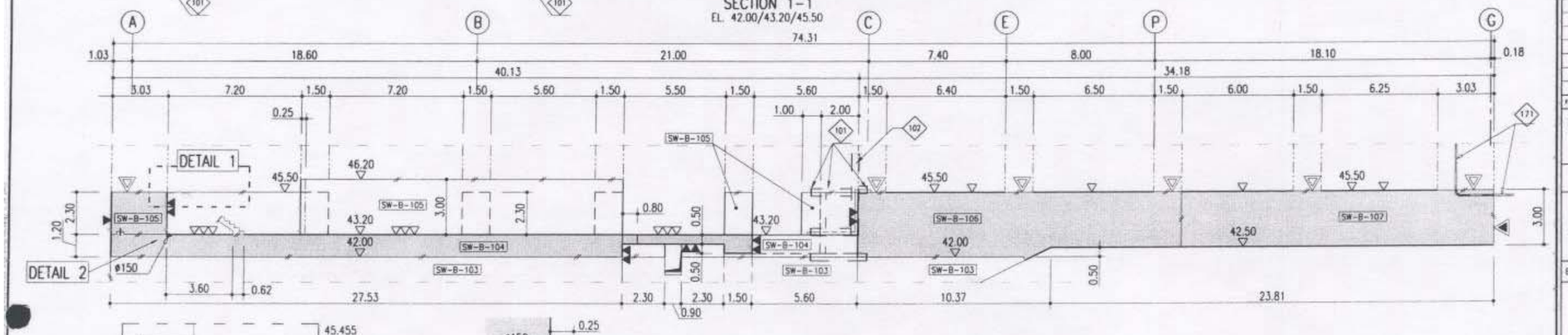
CONCRETE DIMENSION DRAWING

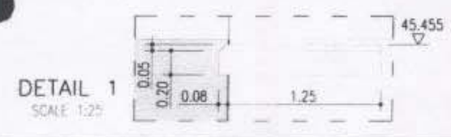
prepared: Mrsic	08.03.03	SCALE: (A1) 1 : 125	DRWG. NO: C-C C 04 2402	REV. A
checked: Zonke	08.03.03			
approved: Dr Kishk	08.03.03			

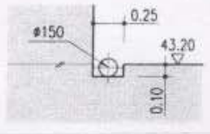












LEGEND

SW-B-107 Coding No. of Concrete Blocks

INSTRUCTION

Nominal Class of Concrete: B 25

Finishes for Unformed Surfaces

- U-CJ Finish
- U1 Finish
- U2 Finish
- U3 Finish

Finishes for Formed Surfaces

- F-CJ Finish
- F1 Finish
- F2 Finish
- F3 Finish

EMBEDDED PARTS

- 101 Metal sheet waterstop 400mm/3mm, St 37
- 102 Elastomer waterstop (DIN7865) "GUMBA FS 300R" or equivalent
- 104 elastomer waterstop (DIN7865) "GUMBA FMS 500R-WSU" or equivalent (with closed cell foam rubber)
- 111 Manhole at pressurized dewatering pump pit.
- 171 Pore pressure cells, cable conduits

REFERENCE DRAWINGS

C-C P 03 1304 POWERHOUSE, AXES 1-8/A-G, PLAN, EL.43.20
C-C P 03 1307 POWERHOUSE, AXES 1-8/A-G, PLAN, EL. 46.60
C-C C 00 2001 GENERAL NOTES
C-C C 03 2402 SLUICEWAY, INTERMEDIATE PIER, AXES A-E/6-8, EL.38.20 TO 42.00 PLAN, EL.42.00 AND SECTIONS

COMPLEMENTARY DRAWINGS

C-C C 03 2404 SLUICEWAY, INTERMEDIATE PIER, AXES A-G/6-8, EL.42.00 TO 45.50 SECTIONS & DETAILS

approval stamp:

APPROVED FOR CONSTRUCTION

REF. MWRI LETTER NO.: 193/202 DATE: 24.01.04

rev.	description	drawn	checked	date
A	Approved by MWRI	Mrsic	Zanke	18.02.04
	As indicated			

NEW NAGA HAMMADI BARRAGE AND HYDROPOWER PLANT
PROJECT IMPLEMENTATION UNIT
MWRI - MEE

TASK 8 - CONSTRUCTION DESIGN

Naga Hammadi Barrage Development Consultants

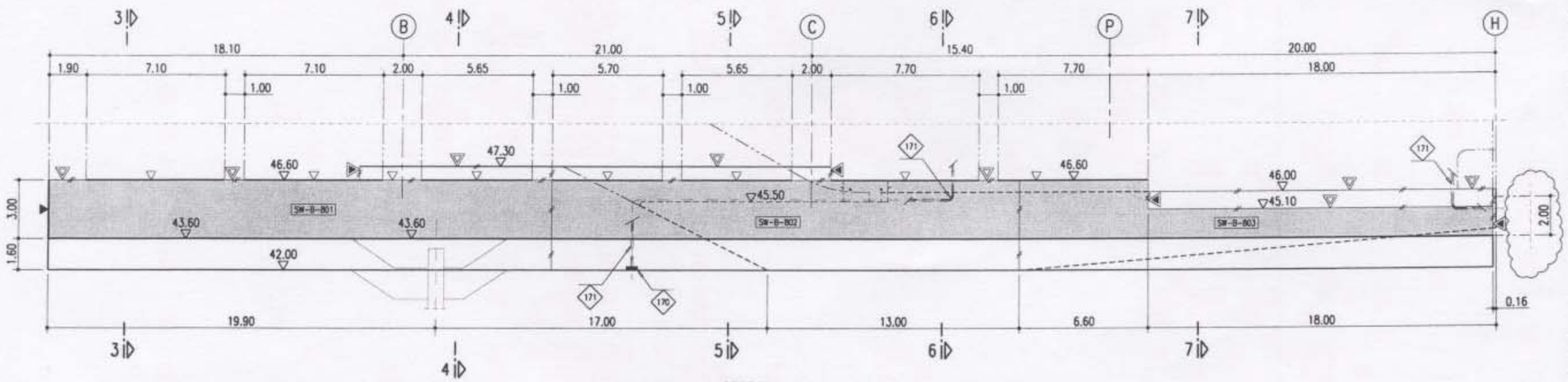
LAHMEYER INTERNATIONAL ELECTROWATT-EKONO Joakko Poyry Group SOGREAH

EMPLOYERS DRWG. NO.:

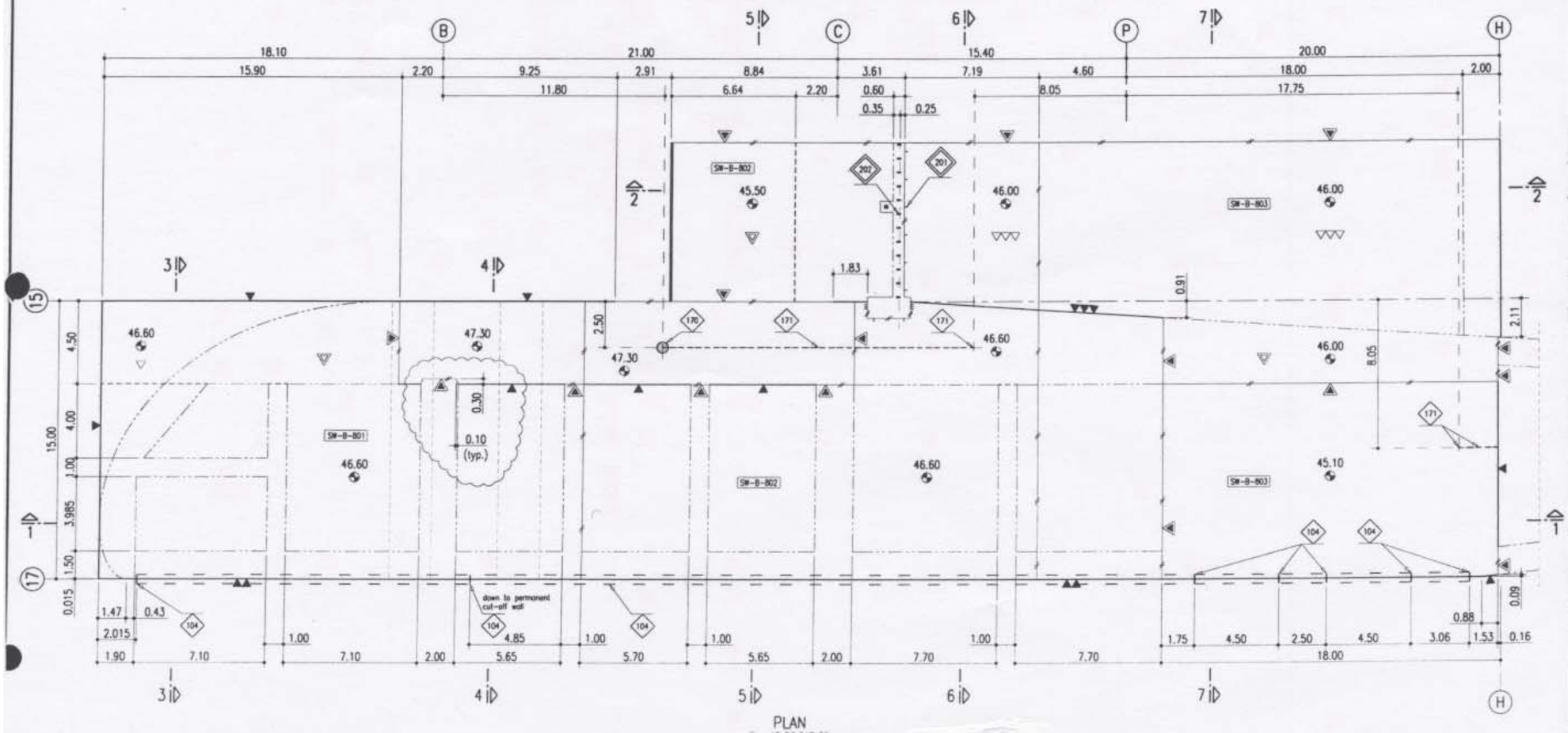
SLUICEWAY
INTERMEDIATE PIER
AXES A-G/6-8, EL. 42.00 TO 45.50
PLAN, EL.46.20 AND SECTIONS

CONCRETE DIMENSION DRAWING

prepared:	Mrsic		12.03.03	SCALE (A1)	DRWG. NO.			REV.
checked:	Zanke		12.03.03	1 : 125	C-C	C	04	2403	A
approved:	Dr.Kohl		12.03.03					



SECTION 1-1
EL. 42.00/47.30



PLAN
EL. 45.50/47.30

LEGEND

SW-B-801 Coding No. of Concrete Blocks

INSTRUCTION

Nominal Class of Concrete: B 25

Finishes for Unformed Surfaces

- U-CJ Finish
- U1 Finish
- U2 Finish
- U3 Finish

Finishes for Formed Surfaces

- F-CJ Finish
- F1 Finish
- F2 Finish
- F3 Finish

EMBEDDED PARTS

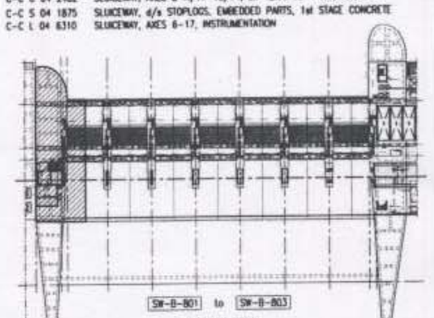
- 104 — elastomer waterstop (DIN7865) "CLIMBA FWS 500R-WSU" or equivalent (with closed cell foam rubber)
- 170 — pore pressure cells acc. to P.T.S. – Section 6
- 171 — pore pressure cells, cable conduit
- 2X3 — No. of Embedded Part, to be supplied by Lot2 Contractor and to be installed by LOT1 Contractor

REFERENCE DRAWINGS

C-C P 04 1402 SLUICEWAY, PLAN AT El. 52.80
C-C P 04 1440 SLUICEWAY, ABUTMENT PIER-u/s PART, PLAN AT El. 46.00/53.25
C-C C 00 2001 GENERAL NOTES

COMPLEMENTARY DRAWINGS

C-C C 04 2480 SLUICEWAY, FOUNDATION SLAB AND ABUTMENT PIER, GEOMETRY
C-C C 04 2482 SLUICEWAY, AXES B-H/17-15/14, El. 42.00 TO 47.30, SECTIONS
C-C S 04 1875 SLUICEWAY, d/s STOPLOGS, EMBEDDED PARTS, 1st STAGE CONCRETE
C-C L 04 8310 SLUICEWAY, AXES 8-17, INSTRUMENTATION



approval stamp:

APPROVED FOR CONSTRUCTION

REF. MWRI LETTER NO.: 2982/202 DATE: 29.10.03

rev.	description	drawn	checked	date
B	modified as indicated	Selim	Zanke	17.01.04
A	Approved by MWRI	Selim	Zanke	30.11.03

NEW NAGA HAMMADI BARRAGE AND HYDROPOWER PLANT
PROJECT IMPLEMENTATION UNIT
MWRI – MEE

TASK B – CONSTRUCTION DESIGN

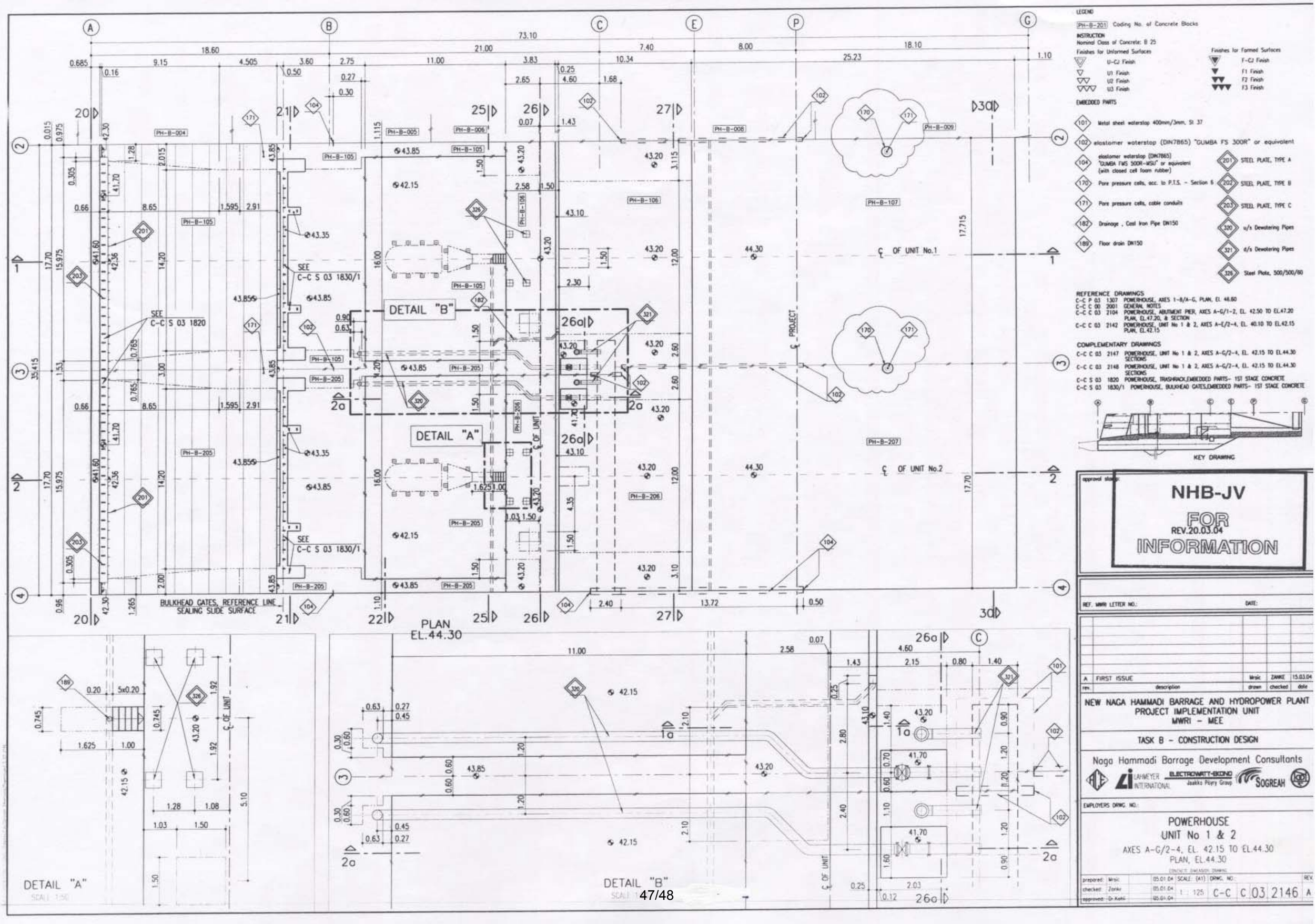
Naga Hammadi Barrage Development Consultants

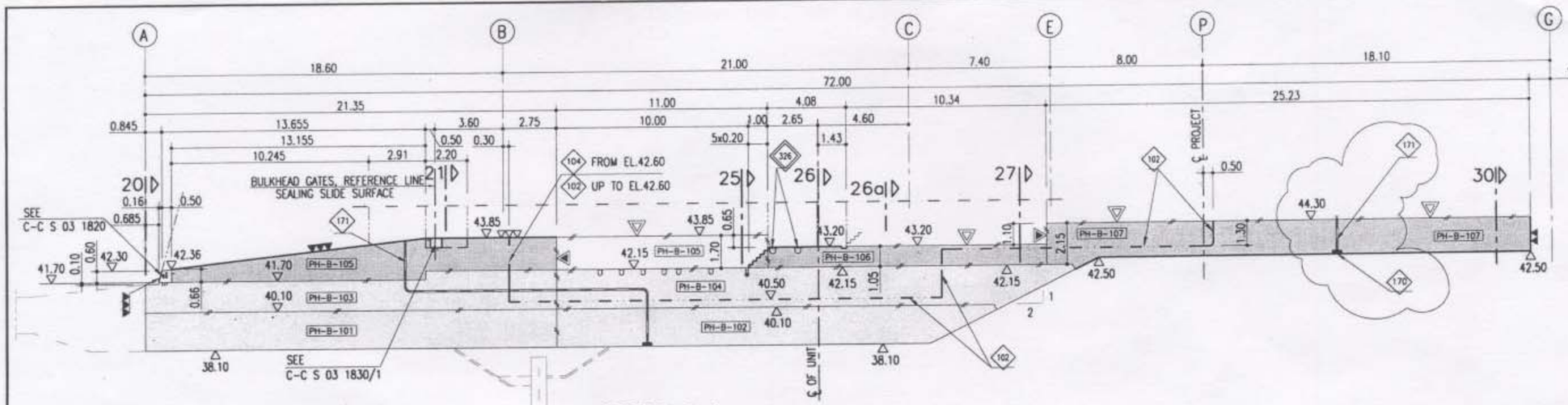
LAHMEYER INTERNATIONAL · ELECTROWATT-EKONO Joakko Pöyry Group · SOGREAH

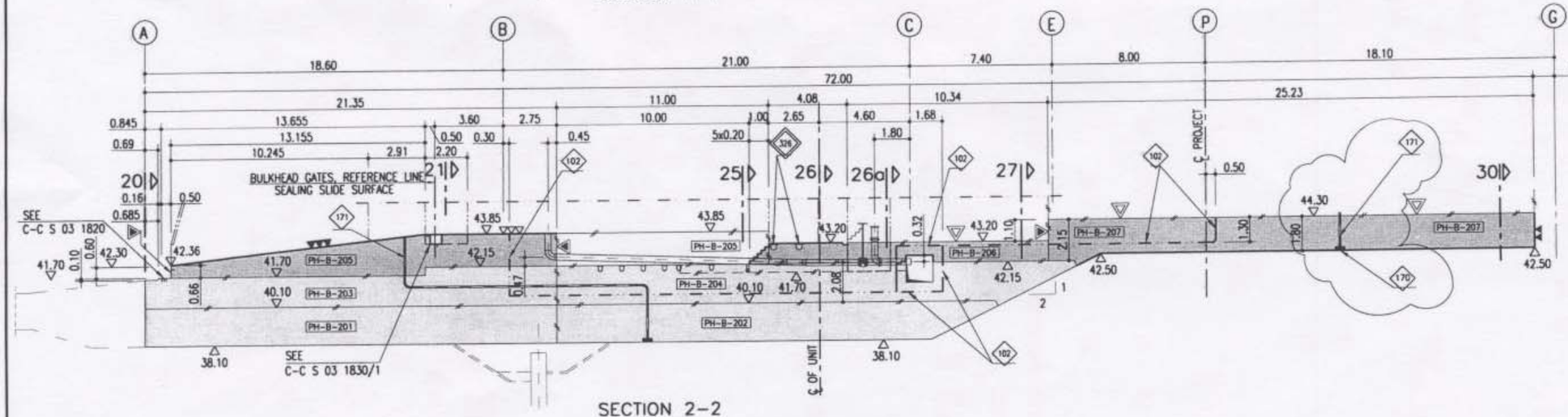
EMPLOYERS DRWG. NO.:

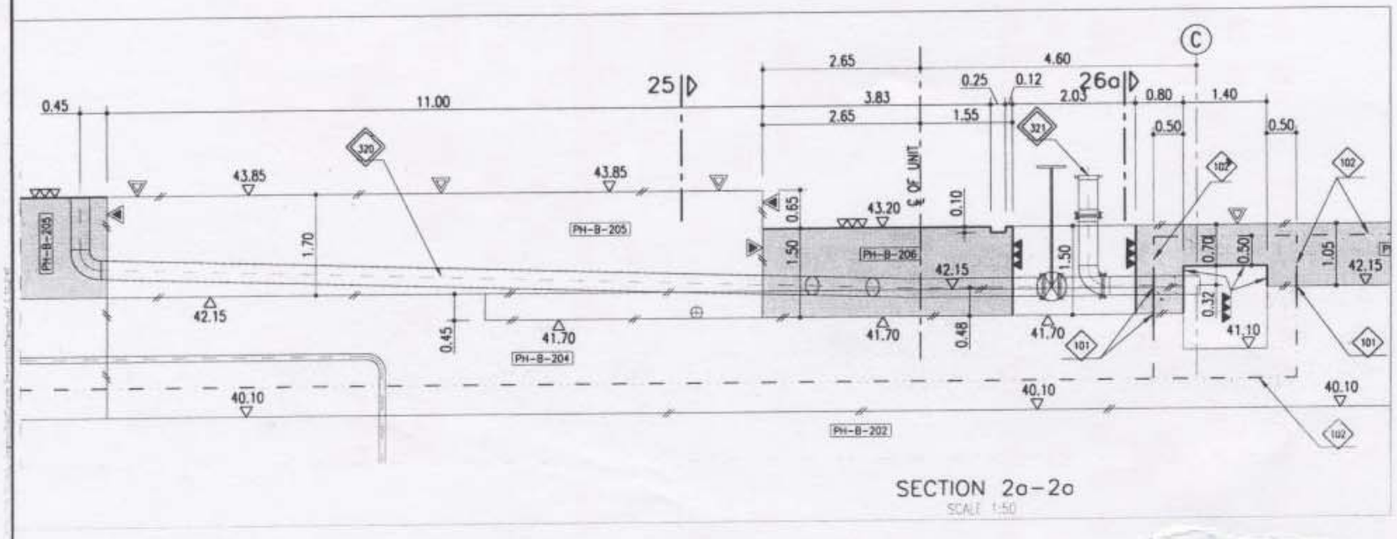
SLUICEWAY
AXES B-H/17-15/14, EL. 42.00 TO 47.30
PLAN AND SECTION

prepared: Saleh		10.04.03	SCALE: (A1)	DRWG. NO.:		REV.
checked: Zanke		10.04.03	1 : 125	C-C	C 04 2481	B
approved: Dr.Kahl		10.04.03				

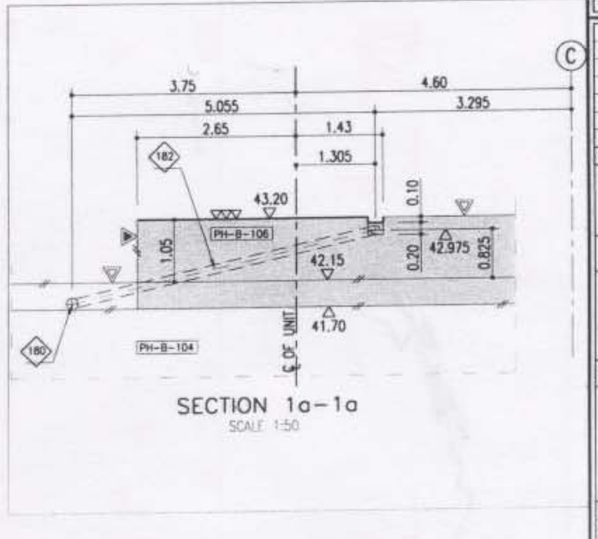

DETAIL "B"
DETAIL "A"
SEE C-C S 03 1830/1
SEE C-C S 03 1820
BULKHEAD GATES, REFERENCE LINE SEALING SLIDE SURFACE
PLAN EL.44.30
DETAIL "A"
DETAIL "B"
℄ OF UNIT No.1
℄ OF UNIT No.2
℄ PROJECT
LEGEND
INSTRUCTION
Nominal Class of Concrete: B 25
Finishes for Unformed Surfaces
Finishes for Formed Surfaces
EMBEDDED PARTS
REFERENCE DRAWINGS
COMPLEMENTARY DRAWINGS
KEY DRAWING
NHB-JV
FOR INFORMATION
REV.20.03.04
NEW NAGA HAMMADI BARRAGE AND HYDROPOWER PLANT
PROJECT IMPLEMENTATION UNIT
MWRI – MEE
TASK B – CONSTRUCTION DESIGN
Naga Hammadi Barrage Development Consultants
POWERHOUSE
UNIT No 1 & 2
AXES A-G/2-4, EL. 42.15 TO EL.44.30
PLAN, EL.44.30
C-C C 03 2146







SECTION 2a-2a
SCALE 1:50



SECTION 1a-1a
SCALE 1:50

LEGEND

PH-B-201 Coding No. of Concrete Blocks

INSTRUCTION
Nominal Class of Concrete: B 25

Finishes for Unformed Surfaces
- U-CJ Finish
- U1 Finish
- U2 Finish
- U3 Finish

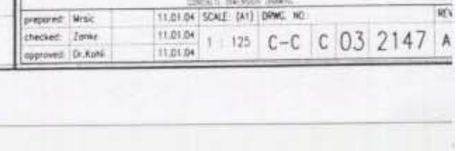
Finishes for Formed Surfaces
- F-CJ Finish
- F1 Finish
- F2 Finish
- F3 Finish

EMBEDDED PARTS

- 101 Metal sheet waterstop 400mm/3mm, St 37
- 102 elastomer waterstop (DIN7865) "GUMBA FS 300R" or equivalent
- 104 elastomer waterstop (DIN7865) "GUMBA FWS 500R-WSU" or equivalent (with closed cell foam rubber)
- 170 Pore pressure cells, acc. to P.T.S. - Section 8
- 171 Pore pressure cells, cable conduits
- 182 Drainage , Cast Iron Pipe DN150
- 201 STEEL PLATE, TYPE A
- 202 STEEL PLATE, TYPE B
- 203 STEEL PLATE, TYPE C
- 320 u/s Dewatering Pipes
- 321 d/s Dewatering Pipes
- 326 Steel Plate, 500/500/60

COMPLEMENTARY DRAWINGS

C-C C 03 2146 POWERHOUSE, UNIT No 1 & 2, AXES A-G/2-4, EL. 42.15 TO EL.44.30 PLAN, EL.44.85
C-C C 03 2148 POWERHOUSE, UNIT No 1 & 2, AXES A-G/2-4, EL. 42.15 TO EL.44.30 SECTIONS
C-C S 03 1820 POWERHOUSE, TRASHRACK,EMBEDDED PARTS- 1ST STAGE CONCRETE
C-C S 03 1830/1 POWERHOUSE, BULKHEAD GATES,EMBEDDED PARTS- 1ST STAGE CONCRETE



KEY DRAWING

approval stamp:

NHB-JV

FOR INFORMATION

REV.2 05.04

REF. MWR LETTER NO.: DATE:

rev.	description	drawn	checked	date
A	FIRST ISSUE	Mrsic	ZANKE	15.03.04

NEW NAGA HAMMADI BARRAGE AND HYDROPOWER PLANT
PROJECT IMPLEMENTATION UNIT
MWRI - MEE

TASK B - CONSTRUCTION DESIGN

Naga Hammadi Barrage Development Consultants

LAHMEYER INTERNATIONAL · ELECTROWATT-EKONO Jaakko Pöyry Group · SOGREAH

EMPLOYERS DRWG. NO.:

POWERHOUSE
UNIT No 1 & 2
AXES A-G/2-4, EL. 42.15 TO EL.44.30
SECTIONS

CONCRETE DIMENSION DRAWING

prepared: Mrsic	11.01.04	SCALE: (A1)	DRWG. NO:		REV.
checked: Zanke	11.01.04	1 : 125	C-C	C 03 2147	A
approved: Dr.Kohl	11.01.04				

Ind.	Date	Prepared	Reviewed	Approved	Description
A	04/01/2005	J.Fraccaroli	X. de Nettancourt	F.Guinchard	First issue

ARAB REPUBLIC OF EGYPT
MINISTRY OF WATER RESOURCES AND IRRIGATION (MWRI)
MINISTRY OF ELECTRICITY AND ENERGY (MEE)
HYDRO-POWER PLANTS EXECUTIVE AUTHORITY (HPPEA)

Naga Hammadi Barrage Development Consultants (NHBDC)

NEW NAGA HAMMADI BARRAGE AND HYDROPOWER PLANT

Lot 1 – Civil Works

Approval Stamp:

MWRI / NHBDC

Document Review

Drawing No.:	Approval Sheet No:

Status of approval

A	Approved	
AN	Approved except as Noted	
RR	Returned for correction and Resubmission	

	name	date
Checked:		
Approved:		

The approval of the drawings will not exonerate the Contractor from any responsiblility in connection with the works.

Status stamp:

Project Document No. : NH 01 05 R 147/A

Naga Hammadi Barrage Joint Venture (NHB-JV)

BILFINGER BERGER VINCI CONSTRUCTION GRANDS PROJETS ORASCOM

Method Statement

Waterstops Connection & Installation

Originator:	First issue date:	Page No. 1 of 11
NHB JV	Reference	Identification Number

Lot				Sc	Section		Issuer		Type			Number				Ind.
N	H	0	1	P	0	0	J	V	M	S	P	1	0	6	7	A

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1 Introduction

This method statement describes the detailed steps for the preparation, the installation and the connection of the different types of waterstops which are required on site.

Two kinds of waterstops will be used on site: metal sheet waterstops (101) and elastomeric waterstops (102, 103, 104 and 105).

2 Reference Documents

2.1 Contractual Documents

Particular Technical Specifications

- Vol. 3, Part II, Section 5 Concrete

General Notes, Waterstops Details

- Drawing C-C S 00 1804 B + 1805 B
- Tender Design Album Dwg. No. 72

2.2 Other Documents

This document shall be read in conjunction with the latest revision of the following documents:

- Related concrete outline drawings Type (C)
- Related rebar drawings Type (R)
- MSFs : NH01 P 00 JV MSF 1070 A + NH01 P 00 JV MSF 1063 A
- Vulcanizing Instructions from Tricosal.

3 Resources

3.1 Equipment

- Vulcanizing accessories (solvent, stripes, vulcanizing equipment...).
- Hand tools.

3.2 Personnel

For each section,

- One team for vulcanization : 1 qualified foreman, 4 qualified workers.
- One welder.
- Four workers for cutting, placing and doing the other connections on the waterstops.

4 Materials

The following tables describe the main physical characteristics of the waterstops which will be used on site.

Metal sheet waterstop

Type	Drawings code	Total Width	Thickness
Metal Sheet	101	40 cm	3 mm

Expansion/Contraction joint waterstops

Type	Drawings code	Total Width	Width of expansion part	Thickness of expansion part
FS 310	102	310 mm	80 mm	8 mm
FM 300	103	300 mm	175 mm	10 mm
FMS 500 HS	104	500 mm	230 mm	12 mm
FMS 500	105	500 mm	230 mm	12 mm

5 Execution Instructions

5.1 Vulcanizing instructions

Vulcanizations have to be carried out either on the prefabrication area or in situ.

L and T shaped pieces have to be vulcanized in the factory.

5.1.1 Measuring and Marking

The waterstops shall be unrolled and placed stressfree on an even surface.

The waterstops shall be measured and the cut shall be marked straight and in a 90 degree angle.

5.1.2 Accurate, Straight Cutting

The waterstops shall be cut to the required length in a straight and in a right angle. The lateral steel plates are cut with a jigsaw (metal saw blade).

5.1.3 Straight and right-angled cut of the Elastomer

The Elastomer (rubber) is cut with a sharp knife in a straight and 90 degree angle, using water as a lubricant for cutting (pre-wetting of the knife).

5.1.4 Grinding of the Rubber Surface

Both waterstops ends and surfaces on either side shall be ground at least 30-40 mm back from the joint line by using a grinder, attached to a drilling machine, until a suede-like finish is obtained. The small and fine ribs of the sealing parts are removed by grinding, whereas the anchoring ribs shall be maintained. Care is to be taken that the web thickness of the waterstop shall not be weakened. The prepared surfaces and ends shall be cleaned carefully and thoroughly with the aid of a brush.

5.1.5 Smooth grinding of the steel plates

The lateral steel plates are ground smooth and blank in a width of 40 mm by means of a angle grinder and a grinding disk. The zinc layer of the steel plates is thus carefully removed.

5.1.6 Applying the Vulcanizing Solution to the Rubber Surface

Vulcanizing Solution shall be applied by paint brush to the prepared and cleaned rubber waterstop ends. Only a thin layer is to be applied, wet areas shall be avoided. The vulcanizing solution shall dry for approx. 10 – 15 min. prior to the next working steps.

5.1.7 Plugging of the Centre Bulb with a Cellular Foam Plug (for FMS types only)

The centre bulb shall be closed by a round cellular foam plug, length approx. 40 mm, in order to avoid a flow-out of raw rubber into the centre bulb during the vulcanizing process.

5.1.8 Inserting a Raw Rubber Plug into the Centre Bulb (for FMS types only)

Using the raw rubber Adhesion Strip, a plug in the diameter of approx. 20 mm (size of the centre bulb internal diameter) shall be rolled and inserted into the centre bulb.

5.1.9 Applying the Adhesion Strip

One of the ends to be jointed shall be covered with the raw rubber Adhesion Strip. The Adhesion Strip with the protective backing shall be cut to the width of the waterstop + 50 mm, and firmly pressed to the waterstop end. A cover roller is to be used to press the Adhesion Strip onto the waterstop, avoid trapping any air.

Then, the two waterstop ends shall be pushed properly together.

5.1.10 Welding of the Steel Plates

The welding of the steel plates is made by electro welding equipment. The rubber shall not be burned. Any burned rubber has to be grinded down.

5.1.11 Coating of the Steel Plates with Chemosil 211 grey

After cooling of the welding seam the steel plates are coated with Chemosil 211 grey at the upper and lower side of the joint area in a width of approx. 80 mm. Hot air blower shall be used to reduce the drying time.

5.1.12 Coating of the Steel Plates with Chemosil 222 black

After drying of the Chemosil 211 grey the steel plates are coated at the upper and the lower side of the joint area with Chemosil 222 black in a width of approx. 70 mm.

5.1.13 Coating of the Steel Plates with Vulcanizing Solvent

After drying of the Chemosil 222 coat the lateral steel plates are coated with Vulcanizing Solvent in a width of approx. 70 mm. Apply a thin layer.

5.1.14 Applying the Adhesion Strip

The crossover between the rubber and the steel plates are covered in the upper and lower side of the joint area with 2 and approx. 60 mm long Adhesion Strips. The strips are placed side by side with a small overlap.

5.1.15 Application of Cover Strip Type 0 (35 mm * 2 mm)

The rubber part of the waterstop shall be covered on the upper and lower side with one layer of raw rubber Cover Strip Type 0. The strip is applied approx. 30 mm over the steel plates.

It shall firmly be pressed to the waterstop with a small tamping iron and the Cover Roller, to ensure a maximum contact between cover and waterstop.

5.1.16 Application of Cover Strip Type 1 (50 mm * 2.5 mm)

The rubber part of the waterstop shall be covered on the upper and lower side with one layer of raw rubber Cover Strip Type 1. The strip is applied approx. 30 mm over the steel plates.

It shall firmly be pressed to the waterstop with a small tamping iron and the Cover Roller, to ensure a maximum contact between cover and waterstop.

5.1.17 Inserting into the vulcanizing equipment

The waterstop joint is placed into the preheated moulds and positioned centrally. The vulcanizing equipment is closed and the bolts tightened to full extent. On both sides of the equipment the waterstop shall be supported to prevent tensile stress on the joint.

After the heating period (30 min.), the power supply must be switched off.

The waterstop is taken out of the equipment and laid aside without any tension to allow the joint to cool down for approx. 45 min. The butt joint is complete and can carry load stress.

5.2 Metal sheet waterstops connections - Instructions

5.2.1 Connections to the corners

Metal sheet waterstops are directly welded on 50*50*5 mm angles to obtain a corner (see appendix 1).

The fillet weld throat is 3mm thick and shall be continuous all along the angle (40 cm long).

The overlap between the steel waterstop and the angle shall be approx. 30 mm.

First, a prefabrication of a piece of 50 cm metal sheet waterstop will be welded to the angle in the steel workshop in order to have only straight welding to do on site.

5.2.2 Straight Connections

On site, straight connections are welded with 30 mm overlap between the two pieces of metal sheets.

The fillet weld shall be at least 3mm thick and shall be continuous all along the connection (40 cm long).

For more details, see appendix 2.

5.3 Connections between metal sheet and elastomeric waterstops - Instructions

This connection shall be done through the contact between the 1 mm thick steel part of the elastomeric waterstop and the end part of the metal sheet waterstop.

The overlap between these two steel parts shall be approx. 30 mm.

Bolts, nuts and a clamping plate shall provide the tightening between the two steel parts.

A waterproof membrane (type 0 strip used for the vulcanization) shall be incorporated between the plates to ensure the watertightness of the connection (see appendix 3 for details).

6 Health & Safety

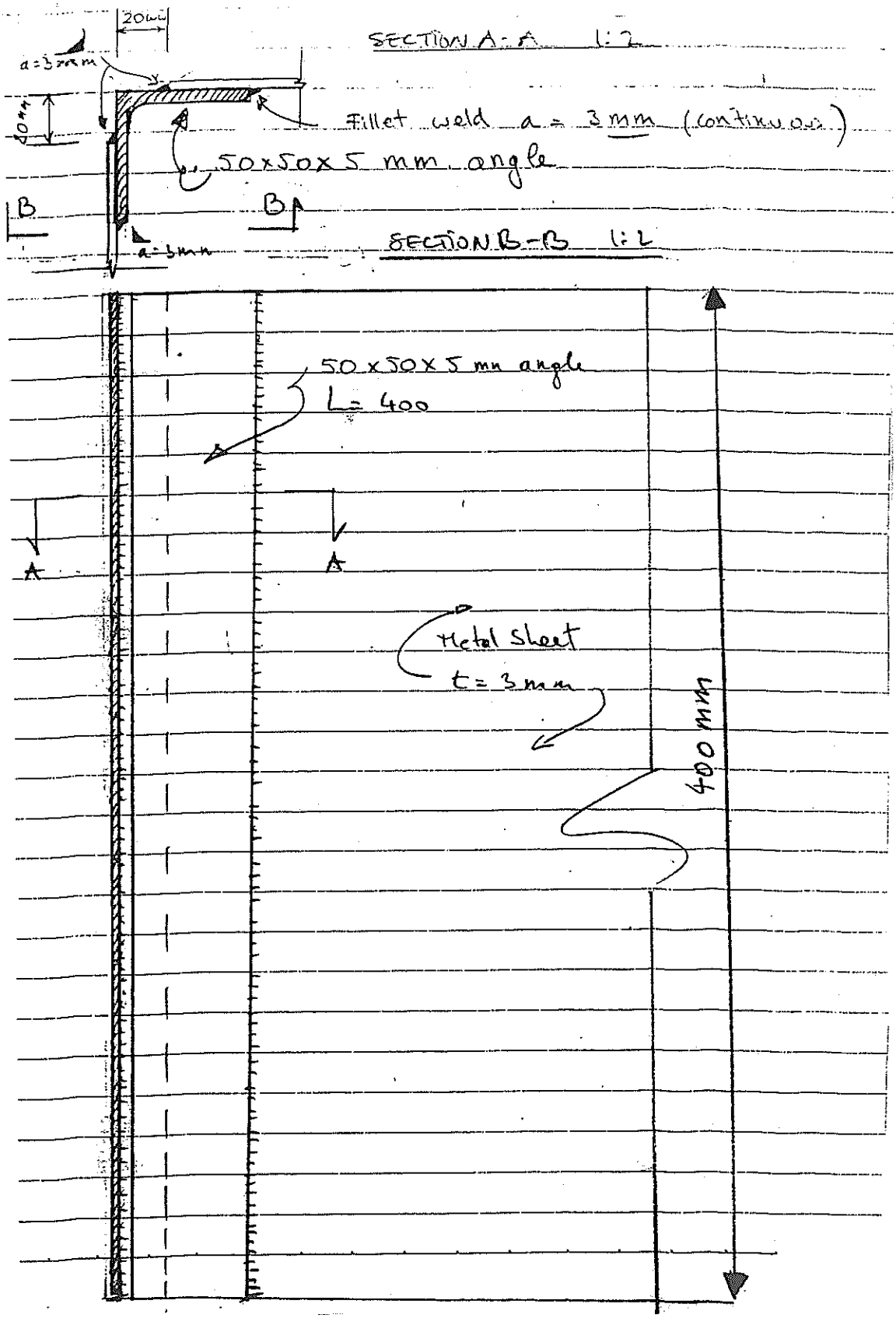
- All persons have to follow the Contractors Health and Safety Plan NH 01 P 00 JV HMS 0001 latest revision.

- All persons working in the construction areas shall be required to wear PPE (Personnel protection equipment).

- All electrical installations must have ground fault circuit interrupter.

- All personnel shall attend the Contractors Safety Training Sessions.

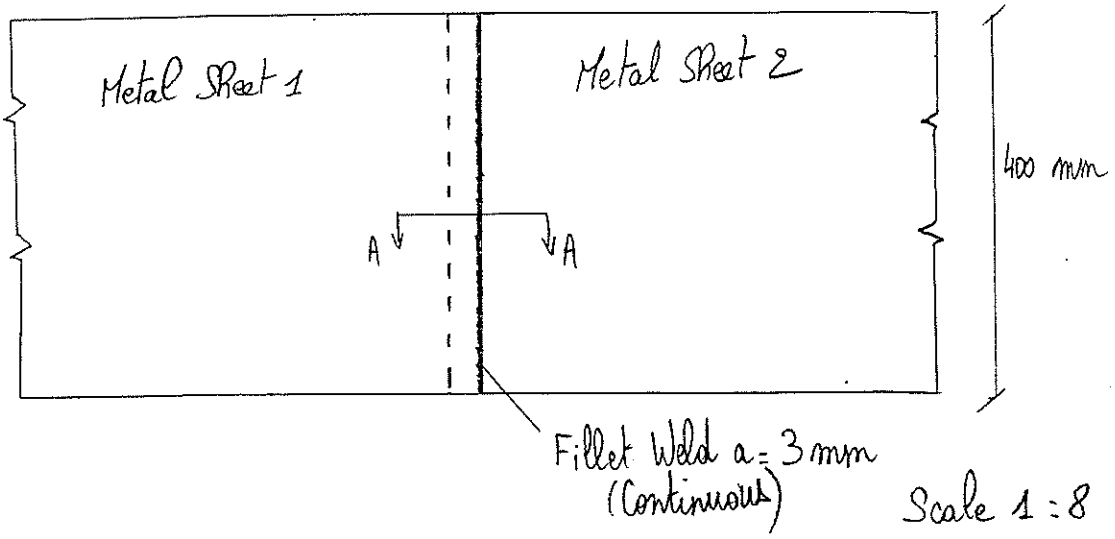
Appendix 1 Metal Sheet Waterstops Corner Detail



NHB – JV		Lot				Sc	Section		Issuer		Type			Number				Ind.
Waterstops connection & installation	Page No. 9 of 11	N	H	0	1	P	0	0	J	V	M	S	P	1	0	6	7	A

Appendix 2

Straight Connection for metal Sheet Waterstops



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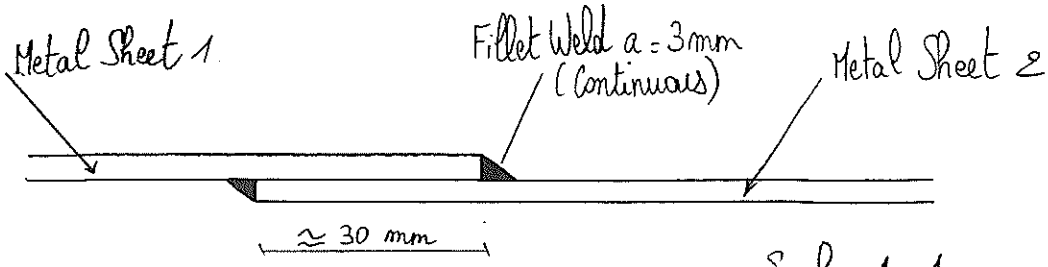

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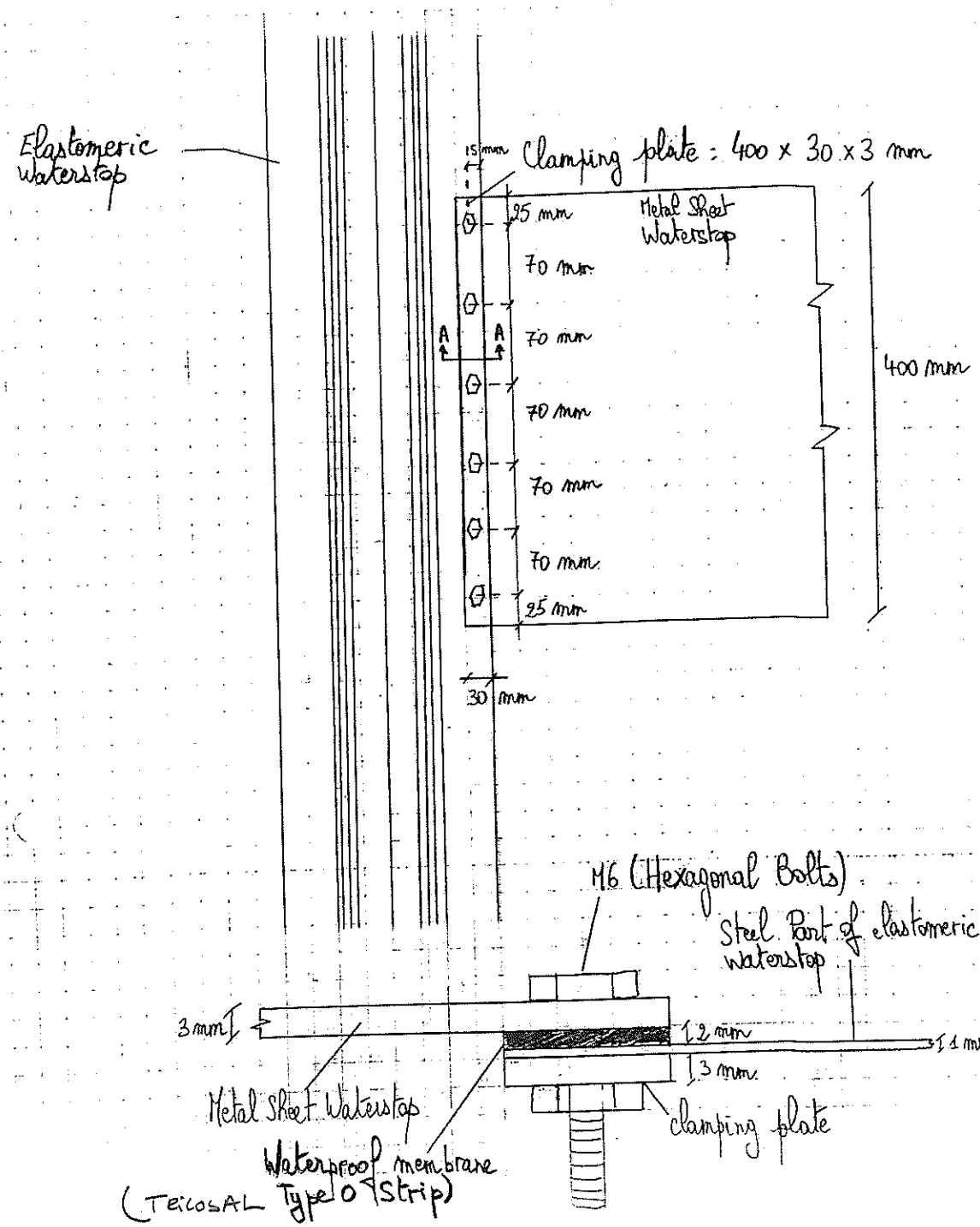
Section A-A

Appendix 3

Connection between metal Sheet & elastomeric waterstop - Details.



Section A-A

NHB – JV		Lot				Sc	Section		Issuer		Type			Number				Ind.
Waterstops connection & installation	Page No. 11 of 11	N	H	0	1	P	0	0	J	V	M	S	P	1	0	6	7	A

WEBAC Corp.
1669 E Wilshire Ave, Santa Ana, CA 92705
PH 714-662-4445 FAX 714-662-4446
Toll Free 1877-932-2293 www.webac.com

PRODUCT DATA SHEET

WEBAC 1403

FLEXIBLE POLYURETHANE INJECTION RESIN

TYPE OF MATERIAL

WEBAC 1403 is a low viscosity two component hydrophobic resin based on a MDI (methylene-diphenyl-isocyanate) polyurethane. The product is 100% solvent free and 100% solids. The gel-time of the product can be adjusted by adding a certain percentage of WEBAC 1400 catalyst. WEBAC 1403 is approved for drinking water contact.

RANGE OF APPLICATION

- **Injection into Wet and Dry Structures**
- **Hairline Crack Injection**
- **Sealing Concrete Cracks & Joints**
- **Sealing Concrete Construction Joints**
- **Brick Construction**
- **Waste Water Tanks**
- **Drinking Water Reservoirs**
- **Sewers, Manholes, Utility Boxes, etc.**
- **Tunnels, Dams**
- **WEBAC 2000 Injection Tube System**

This high-grade and constant-volume polyurethane resin is an universal injection resin designed for application in wet and dry cracks. Unlike water-activated materials WEBAC 1403 does not need water for the reaction. Due to its low viscosity and good penetration properties, WEBAC 1403 is recommended for the injection of hairline cracks. An important property of the very flexible material is the adhesive strength to concrete which is typically higher than the tensile strength of the product. The good adhesion combined with the flexibility of the material assures that the repaired concrete will not crack again. The cured resin is of a constant volume and it is essentially not effected by water or dryness. WEBAC 1403 does not shrink or swell.

WEBAC 1403 may slightly foam in contact with water when applied without pressure. Pressure injection will suppress foaming action and material will cure to a dense and flexible sealant.

WEBAC 1403 is non-corrosive towards steel and is safe for use in combination with foils and joint strips. The material may be used in combination with WEBAC 151/ 157 water-activated foams.

WEBAC 1403 is a product of the WEBAC polyurethane injection resin line and to achieve best results a combination of several products may be recommended in some applications.

PROCESSING

WEBAC 1403 A and 1403 B are supplied in separate containers. WEBAC 1400 catalyst is available to allow adjustment of gel-time. The mixing ratio by volume is 1:1 (A:B). WEBAC 1400 CAT is not a mandatory component of the cured product.It has been designed for the applicator who needs to shorten the gel time.

WEBAC 1400 CAT USAGE

The gel time is adjustable from several hours to approximately 20 minutes by using WEBAC 1400 CAT. Up to 5% of catalyst may be added to the mixture to achieve the shortest gel time. (see diagram on backside)

Example of catalyst usage:
2 gal mixture (7.6 liters)
1% = approx. 2.5 FL OZ. or .07 liters
5% = approx. 12 FL OZ. or .35 liters.

Observe temperature and humidity of the environment since both determine the pot-life of the premixed batch. Do not mix more material than the amount that will be pumped within reasonable time. Rule: High temperatures and high humidity - less accelerator. Metric measuring cups are available to simplify mixing procedures.

It is essential for all equipment to be dry. Avoid any moisture contact with the mixture to prevent premature reaction of the product. If reaction of the batch occurs while pumping, immediately shut down the machine and flush with a cleaner to avoid built up and clogging of the equipment.

MAINTENANCE OF EQUIPMENT

Remove all excess sealant and any smears. Tools and mixing equipment are best cleaned immediately after use. WEBAC provides R70 Pump Flush, a solvent free, non-flammable, non-hazardous cleaner. Xylol, Toluol, Acetone and M.E.K. can be used if not in conflict with regulations on jobsite. Circulate cleaner through pump for several minutes. Caution! Some cleaners are combustible.

PRECAUTION

Protect your health! While working with WEBAC materials safety goggles, gloves and safety clothing must be worn at all times. While injecting, a full face shield is strongly recommended. Spills and blow-outs do happen! Also observe container labels, MSDS, and instructions in the WEBAC Product Catalog. In case one of the components comes in contact with the skin, wash thoroughly with soap and water. Provide adequate ventilation in volume and pattern in working area. Further protection: emergency showers and eyewash stations.

WEBAC Corp.
1669 E Wilshire Ave, Santa Ana, CA 92705
PH 714-662-4445 FAX 714-662-4446
Toll Free 1877-932-2293 www.webac.com

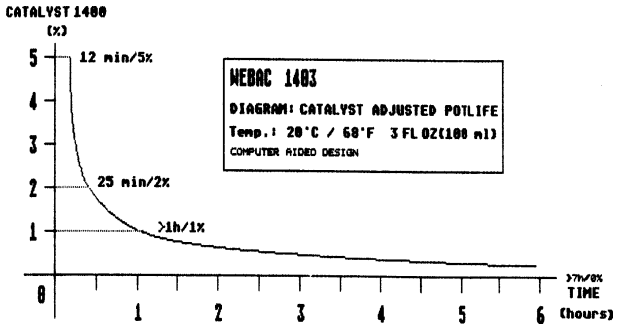
PRODUCT DATA SHEET

WEBAC 1403

FLEXIBLE POLYURETHANE INJECTION RESIN

TECHNICAL DATA				
	Comp. A	Comp. B	1400 CAT	
Appearance	Clear	Dark Brown	Clear	
Solids	100%	100%	100%	ASTM D 1010
Density, g/ml	1.02	1.14	1.16	ASTM D 3800-79
Flash Point, C / F	156/313	180/356	165/335	ASTM D 93-85
Viscosity, cps	60-70	80-90	50	ASTM D 1638-74
Mixing Ratio by Volume	1 parts	1 part	5% max.	
Packaging	5 Gal	5 Gal	0.5 Gal	

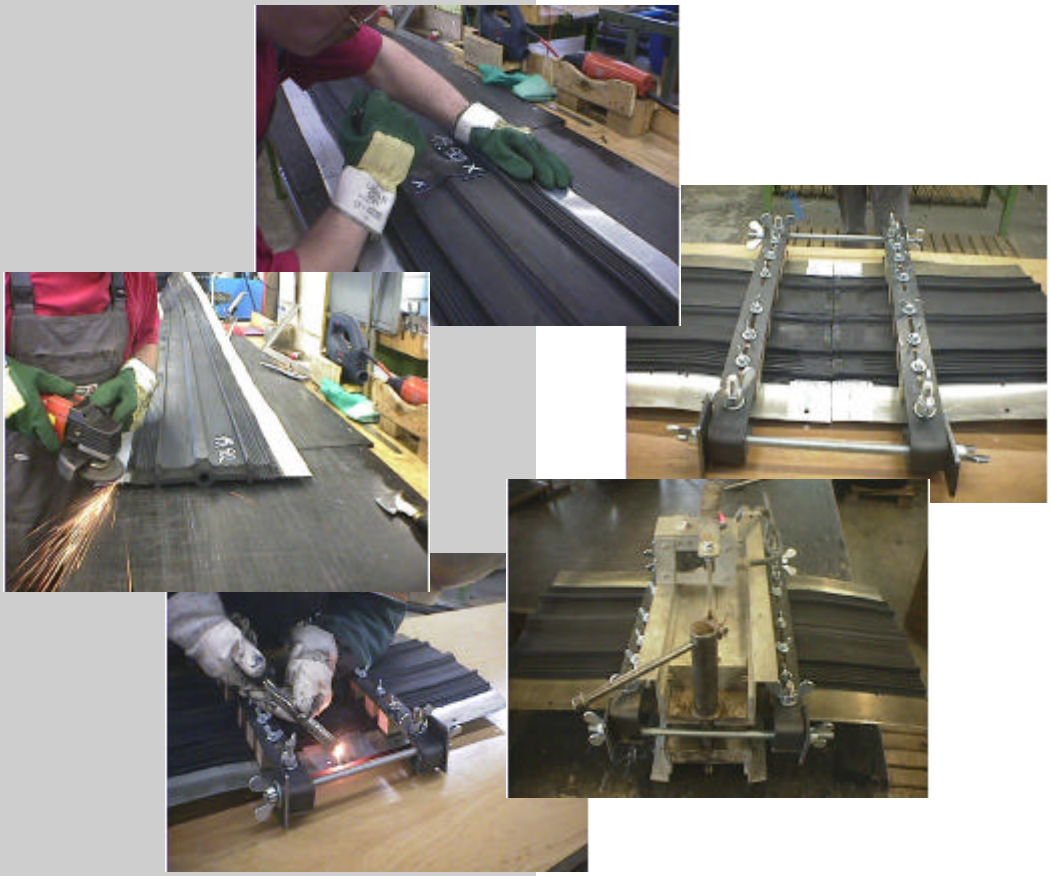
Cured Product	
Hardness, Shore D	20-30
Elongation, %	>100 ASTM D 638
Tensile Strength, psi	260 ASTM D 638
Adhesive Strength, to Concrete, psi	>260
Corrosiveness	Non-Corrosive
Storage	Good storage stability at 15-30C, 58-85 F. Store indoors.
Appearance	Dark Brown Polyurethane Sealant
Toxicity	Essentially Non-Toxic in Cured Form **MDI Based, Drinking Water Approved**
Resistance to Chemicals	Resistant to Most Organic Solvents, Mild Acids, Alkali and Micro Organisms



MEMBER INTERNATIONAL CONCRETE REPAIR INSTITUTE

PRODUCT WARRANTY: WEBAC AMERICA CORP. PRODUCTS ARE WARRANTED UNDER THE FOLLOWING POLICY:
ALL RECOMMENDATIONS, STATEMENTS AND TECHNICAL DATA HEREIN ARE BASED ON TESTS WE BELIEVE TO BE RELIABLE AND CORRECT, BUT ACCURACY AND COMPLETENESS OF SAID TESTS ARE NOT GUARANTEED AND ARE NOT TO BE CONSTRUED AS A WARRANTY EITHER EXPRESSED OR IMPLIED. USER SHALL RELY ON HIS OR HER OWN INFORMATION AND TESTS TO DETERMINE SUITABILITY OF THE PRODUCT FOR THE INTENDED USE AND USER ASSUMES ALL RISK AND LIABILITY RESULTING FROM HIS OR HER USE OF THE PRODUCT. SELLER'S AND MANUFACTURER'S SOLE RESPONSIBILITY SHALL BE TO REPLACE THAT PORTION OF THE PRODUCT OF THIS MANUFACTURER WHICH PROVES TO BE DEFECTIVE. NEITHER SELLER NOR MANUFACTURER SHALL BE LIABLE TO THE BUYER OR ANY THIRD PERSON FOR ANY INJURY, LOSS OR DAMAGE DIRECTLY OR INDIRECTLY RESULTING FROM USE OF OR INABILITY TO USE THE PRODUCT. RECOMMENDATIONS AND STATEMENTS OTHER THAN THOSE CONTAINED IN A WRITTEN AGREEMENT SIGNED BY AN OFFICER OF THE MANUFACTURER SHALL NOT BE BINDING UPON THE MANUFACTURER OR SELLER. WAC200012-W1403

Vulcanizing Instructions



for internally placed Waterstops with steel plates, Types

- **FS**
- **FMS**

Tricosal bbz

Edition 1/1999

Vulcanizing Instructions

1. Measuring and Marking

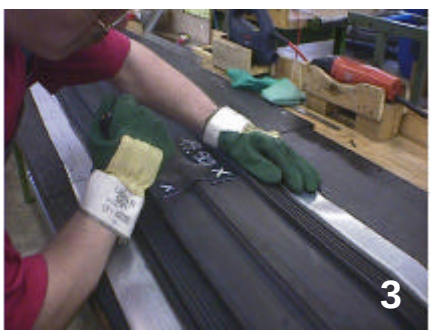
The waterstops shall be unrolled and placed stress-free on an even surface.
The waterstops shall be measured and the cut shall be marked straight and in a 90° angle..

Remarks:
The following work is carried out on a clean and even surface, e.g. form board. During the preparatory work, the vulcanizing equipment with the moulds is preheated.
Wear protective gloves during all work!

2. Accurate, Straight Cutting

The waterstops shall be cut to the required length in a straight and in a right angle. The lateral steel plates are cut with a jigsaw (metal saw blade).

Remarks: Wear protective glasses and ear protection



3. Straight and right-angled cut of the Elastomer

The Elastomer (rubber) is cut with a sharp knife in a straight and 90° angle, using water as a lubricant for cutting (pre-wetting of the knife)

Remarks: Wear protective gloves!

Contaminated waterstops shall be cleaned prior to the following working steps.

4. Grinding of the Rubber Surface

Both waterstops ends and surfaces on either side shall be ground at least 30 - 40 mm back from the joint line by using a grinder (special grinder available from Tricosal), attached to a drilling machine, until a suede-like finish is obtained. The small and fine ribs of the sealing parts are removed by grinding, whereas the anchoring ribs shall be maintained. Care is to be taken that the web thickness of the waterstop shall not be weakened. The prepared surfaces and ends shall be cleaned carefully and thoroughly with the aid of a brush.

Remarks: Wear protective goggles!

Edition 1/1999

5. Smooth grinding of the steel plates

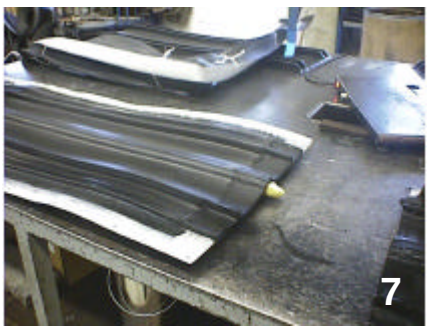
The lateral steel plates are grinded smooth and blank in a width of 40 mm by means of a angle grinder and a grinding disk. The zinc layer of the steel plates is thus carefully removed.

Remarks: Wear protective goggles!

6. Applying the Vulcanizing Solution to the Rubber Surface

Vulcanizing Solution shall be applied by paint brush to the prepared and cleaned rubber waterstop ends. Make sure that all surfaces on either side and the ends are completely covered. Only a thin layer is to be applied, wet areas shall be avoided. The vulcanizing solution shall dry for approx. 10 - 15 minutes prior to the next working steps.

Remarks: Check for a complete application, especially in the edges of the profile. Avoid skin contact with the vulcanizing solvent and care für good ventilation.



7. Plugging of the Centre Bulb with a Cellular Foam Plug (FMS types)

The centre bulb shall be closed by a round cellular foam plug, length approx. 40 mm, in order to avoid a flow-out of raw rubber into the centre bulb during the vulcanizing process..

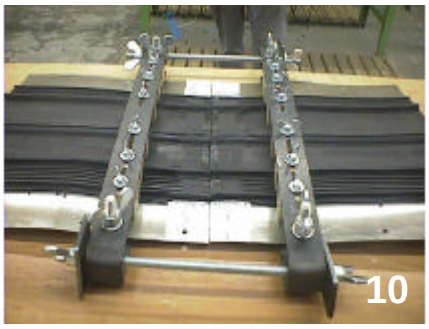
8. Inserting a Raw Rubber Plug into the Centre Bulb (FMS types)

Using the raw rubber Adhesion Strip, a plug in the diameter of approx. 20 mm (size of the centre bulb internal diameter) shall be rolled and inserted into the centre bulb. Prior to the insertion of the raw rubber plug, the internal face of the waterstop centre bulb shall be primed with the Vulcanizing Solution.

Edition 1/1999

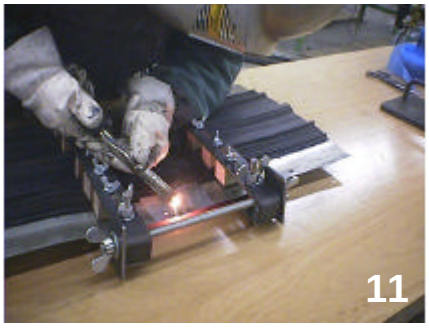
9. Applying the Adhesion Strip

When the Vulcanizing Solution has completely dried (must be non-tacky), one of the ends to be jointed shall be covered with the raw rubber Adhesion Strip. The Adhesion Strip with the protective backing shall be cut to the width of the waterstop + 50 mm, and firmly pressed to the waterstop end. The protective cover is removed. A Cover Roller is to be used to press the Adhesion Strip onto the waterstop, avoid trapping any air. Any surplus of the Strip shall be bent and pressed firmly around the corners.
Any air bubbles are to be punctured and the Strip is to be pressed firmly to the waterstop.



10. Jointing of the Waterstop ends, Tightening with the Fixing Clamps

The two waterstop ends shall be pushed properly together. The fixing clamps are to be used for a longitudinal bracing of the joint and the waterstop ends are tightly pressed together without tensile stress. When bracing with the fixing clamps, the joint area shall not bulge.
Any voids in the joint shall be filled with the Adhesion Strip.
The fixing clamps shall be kept in place and are only removed after the joint has been completely vulcanized, finished and cooled down.
Inaccurate cutting of the waterstop may lead to voids in the joint area. These voids are stuffed with Adhesion Strip.



11. Welding of the Steel Plates

The welding of the steel plates is made by shielded gas air welding. Electro welding equipment is unsuitable due to the low thickness of the steel.
The steel plates are fixed by means of e.g. vise-grip wrench and tightly welded. A distance of 5 - 10 mm to the elastomer (rubber) part has to be kept. The rubber shall not be burned. Any burned rubber has to be grinded down.

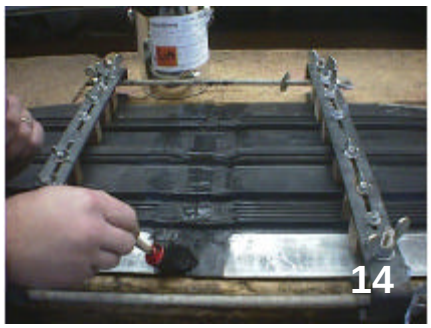
12. Coating of the Steel Plates with Primer grey

After cooling of the welding seam the steel plates are coated with Primer grey at the upper and lower side of the joint area in a width of approx. 80 mm. The drying time at room temperature is approx. 2 hours, and may be reduced by use of an hot air blower. Careful blowing of warm air (lukewarm, not over 60°C) will achieve a drying of the coat in approx.. 10 min.

Edition 1/1999

13. Coating of the Steel Plates with Primer black

After drying of the Primer grey the steel plates are coated at the upper and lower side of the joint area with Primer black in a width of approx. 70 mm. See Primer grey (step 12) with regard to drying times.

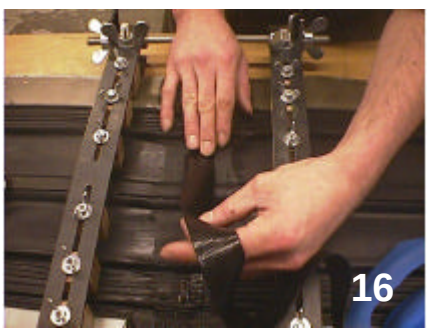


14. Coating of the Steel Plates with Vulcanizing Solvent

After drying of the Primer coat the lateral steel plates are coated with Vulcanizing Solvent in a width of approx. 70 mm. Apply a thin layer, drying time approx. 10 - 15 min.

15. Applying the Adhesion Strip

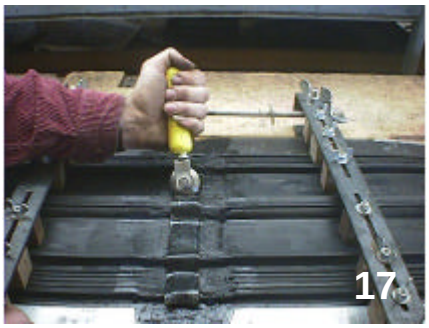
The crossover between the Elastomer (rubber) and the steel plates are covered in the upper and lower side of the joint area with 2 and approx. 60 mm long Adhesion Strips. The strips are place side by side with a small overlap. One half of the strip layer is placed over the Elastomer part, the other half (30 mm) over the steel plate. The Cover Roller is to be used to press the Adhesion Strip onto the waterstop, avoid trapping any air.



16. Application of Cover Strip Type 0 (35 mm x 2 mm)

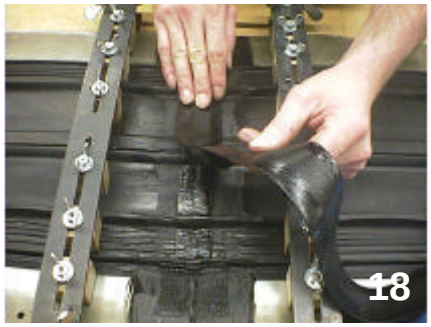
The Elastomer part of the waterstop shall be covered on the upper and lower side with one layer of raw rubber Cover Strip Type 0. The Cover Strip is separated from the protection foil in a length according to the width of the waterstop plus an allowance of 100 mm, cut and placed across the joint of the waterstop. The strip is also applied approx. 30 mm over the steel plates and fixed at the edges by using a small tamping iron.

Edition 1/1999



17. Pressing home of Cover Strip Type 0

The Cover Strip Type 0 shall firmly be pressed to the waterstop with a small tamping iron and the Cover Roller, to ensure a maximum contact between cover and waterstop. Special care has to be taken to press and roll the cover at the edges and grooves of the waterstop profile. Trapping any air shall be avoided, any air bubbles shall be punctured and the cover pressed once more to the waterstop.

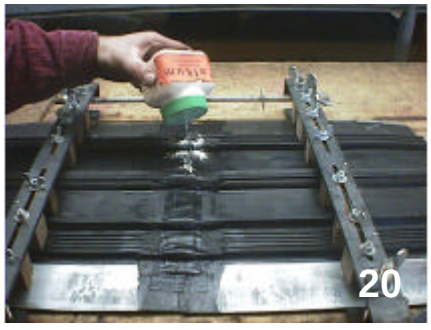


18. Application of Cover Strip Type 1 (50 mm x 2,5 mm)

The Elastomer part of the waterstop joint shall be covered on the upper and lower side with one layer of raw rubber Cover Strip Type 1. The Cover Strip is separated from the protection foil in a length according to the width of the waterstop plus an allowance of 100 mm, cut and placed across the joint of the waterstop. The strip is also applied approx. 30 mm over the steel plates and fixed at the edges by using a small tamping iron (upper and lower side).

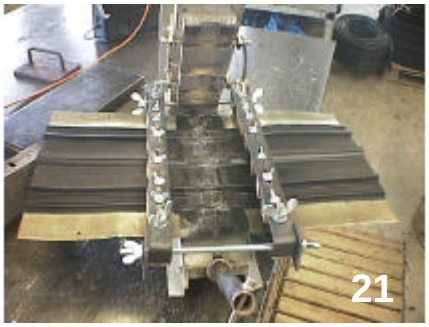
19. Pressing home of Cover Strip Type 1

The Cover Strip Type 1 shall firmly be pressed to the waterstop with a small tamping iron and the Cover Roller, to ensure a maximum contact between cover and waterstop. Special care has to be taken to press and roll the cover at the edges and grooves of the waterstop profile. Trapping any air shall be avoided, any air bubbles shall be punctured and the cover pressed once more to the waterstop.



20. Powdering of the waterstop with Talcum Powder

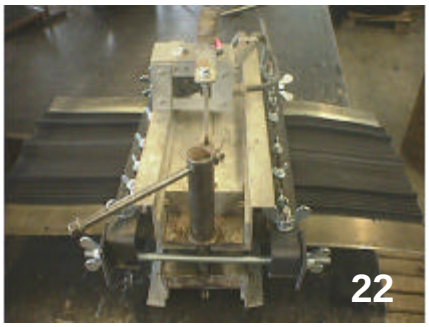
The upper and lower side of the joint area covered with raw rubber strips shall be powdered with talcum. Talcum is used as demoulding agent for easier removal of the waterstop from the equipment after the vulcanizing process.



21. Inserting into the vulcanizing equipment

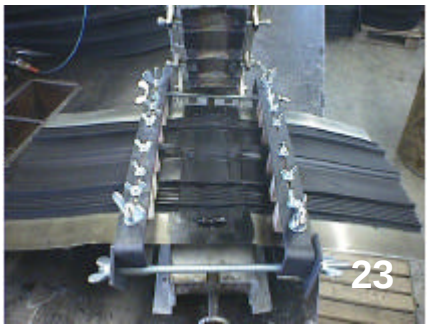
The vulcanizing equipment with the inserted waterstop moulds shall be pre-heated for approx. 15 - 20 minutes. The waterstop joint is placed into the preheated moulds and positioned centrally. The vulcanizing equipment is closed and the bolts tightened to full extent. On both sides of the equipment the waterstop shall be supported (e.g. bricks, timber) to prevent tensile stress on the joint.

Remarks: Heat-resistant gloves shall be worn while working with the heated vulcanizing equipment



22. Vulcanizing of the butt joint

In pre-heated vulcanizing equipment the waterstop shall be heated for approx. 35 - 45 minutes. At lower temperatures or strong wind the heating time shall be extended for 5 - 10 minutes. Some minutes after the beginning of the heating the bolts of the equipment shall be re-tightened until raw rubber flows out.



23. Removal from vulcanizing equipment

After the heating period, the the power supply shall be switched off. The equipment is opened and a first check of the joint is to be carried out.

The butt joint is completely vulcanized when an impression with a screw driver does not remain and is put back elastically. Otherwise, the heating time is extended for 5 - 10 minutes.

24. Ready waterstop butt joint

The waterstop is taken out of the equipment and laid aside without any tension to allow the joint to cool down for approx. 45 minutes. The butt joint is now complete and can carry load stress.

.

Contents of a Vulcanizing Kit

Basic Equipment

- Vulcanizing equipment and moulds
- Fixing Clamps
- Vulcanizing Instructions
- Cover Roller

Vulcanizing Accessories (upon order)

- Vulcanizing Solution
- Primer grey
- Primer black
- Haftfolie
- Adhesion Strip
- Cover Strip Type 0 (35 mm x 2 mm)
- Cover Strip Type 1 (50 mm x 2,5 mm)
- Talcum
- Cellular Plug
- 2 waterstop samples for a vulcanizing test

Tools required on site

Tools (available from Tricosal upon order):

- Special Knife / Knife
- Special Grinder
- Protective Goggles

Tools (by contractor):

- Shielded Gas Welding Equipment
- Shielded Gas
- Drilling Machine
- Jig Saw (metal saw blade)
- Angle Grinder with grinding disk
- Paint Brush
- Protective Gloves/Heat Resistant Gloves
- Measuring Tape
- Marking Pencil
- Scissors
- Angle

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Edition 1/1999

23 2 2005

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JAN 10 2005

JAN 10 2005

Metal sheet waterstop

Type	Drawings code	Total Width	Thickness
Metal Sheet	101	40 cm	3 mm

Expansion/Contraction joint waterstops

Type	Drawings code	Total Width	Width of expansion part	Thickness of expansion part
FS 310	102	310 mm	80 mm	8 mm
FM 300	103	300 mm	175 mm	10 mm
FMS 500 HS	104	500 mm	230 mm	12 mm
FMS 500	105	500 mm	230 mm	12 mm

قواطع المياه (waterstop)

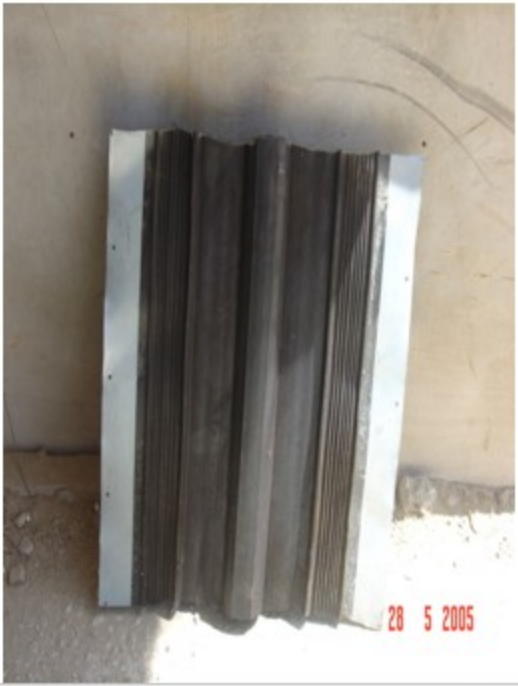
- توجد بالمشروع خمسة أنواع من قواطع المياه
- 101 Steel waterstop 400/3mm steel 37.
- ويستخدم في الفواصل الإنشائيه

103 Elastomer Waterstop FM 320.

- ويستخدم في الفاصل في الحوائط الساندة

104 Elastomer Waterstop FMS 500R

- ويستخدم في فواصل الإنكماش (Contraction Joints)



105 Elastomer Waterstop FMS 500R

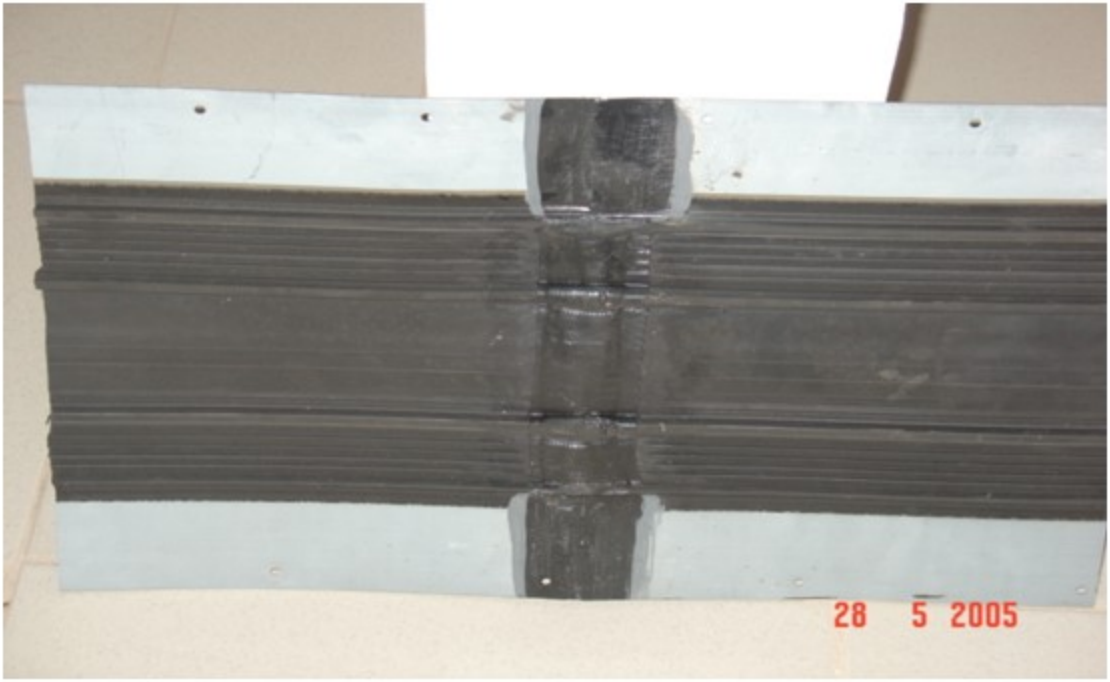
- ويستخدم في فواصل التمدد (Expansion Joints)

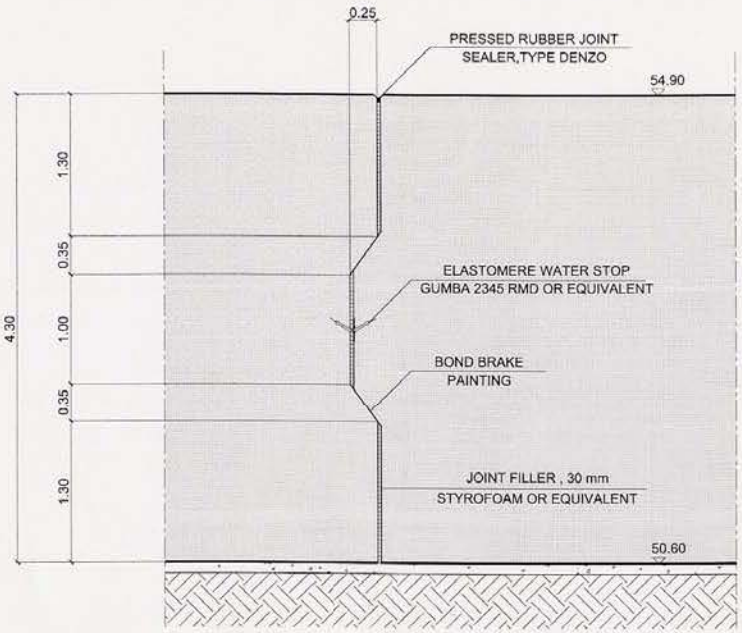
Connection of waterstop

Steel to Steel waterstop

Steel to Elastomer Waterstop

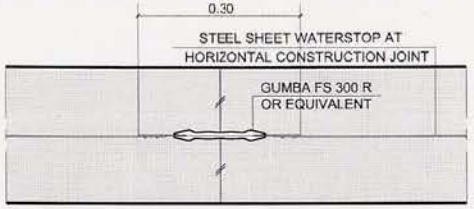
Elastomer To Elastomer Waterstop





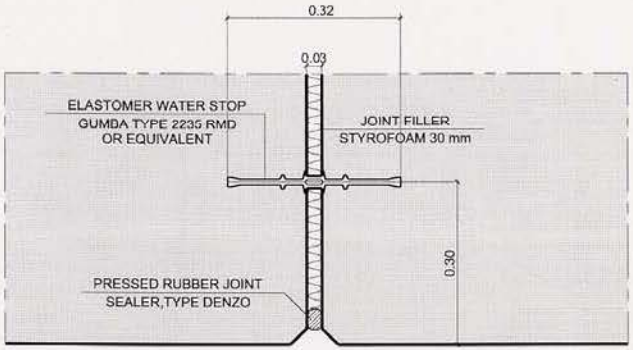
SHEAR KEY AT NAVIGATION LOCK BOTTOM SLAB

TYPICAL FOR ALL BOTTOM SLABS
SCALE 1/50



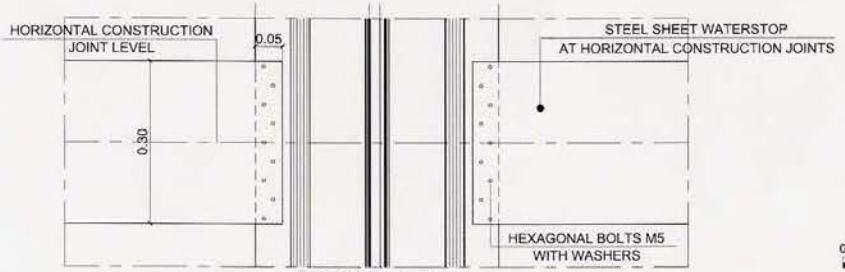
CONSTRUCTION JOINT DETAIL

TYPICAL FOR VERTICAL JOINT

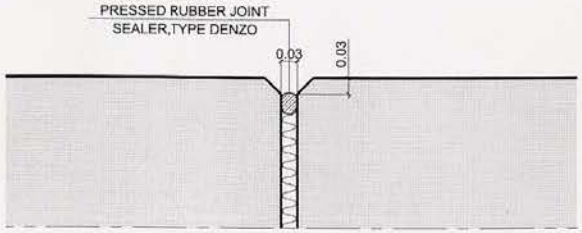


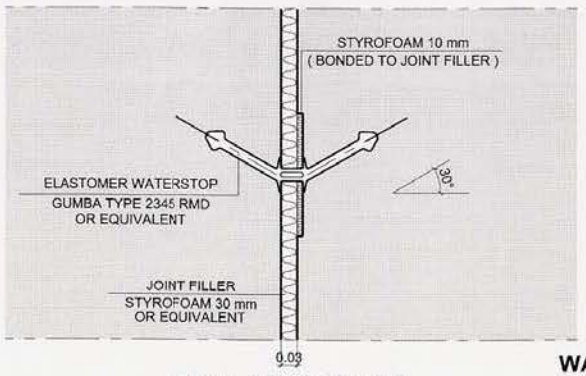
WATERSTOP TYPE II
EXPANSION JOINT DETAIL

TYPICAL FOR RETAINING WALLS



SECTION A - A

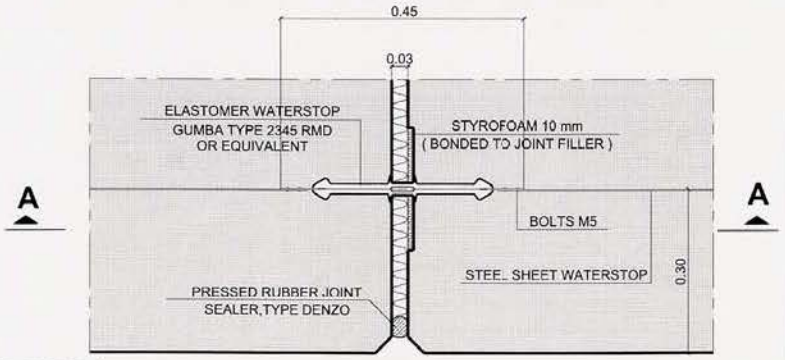




TYPICAL SECTION IN SLABS

WATERSTOP TYPE 1
EXPANSION JOINT DETAIL

TYPICAL FOR SLUICEWAY, NAV. LOCK
AND POWERHOUSE



TYPICAL SECTION IN WALLS

SCALE
0 0.1 0.2 0.3 0.4 0.5 0.6m
(ORIG. SCALE : 1/10)

SCALE
0 0.5 1.0 1.5 2.0 2.5 3.0 m
(ORIG. SCALE : 1/50)

New Naga Hammadi Barrage and Hydropower Plant
Project Implementation Unit
MWRI - MEE

TENDER DESIGN

Naga Hammadi Barrage Development Consultants

SOGREAH

STANDARD DETAILS

WATER STOPS

PREP./CHECKED / DATE
KA/PZ/OCT. 99

APPR.: DATE

DRAWING NO.
C 20-01

Tender Technical Documents for Waterstops

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PART I - General Technical Specifications

1. GENERAL

The new Naga Hammadi Barrage is located on the Nile river at about 360km downstream of the Aswan high dam. At this location, the Nile river bed is at 50.00m asl and the width is 300m. The nominal upstream water level of the new Barrage will be at 65.90m asl.

The lowest bottom of concrete structures will be at 38.10m asl and the general access level will be at 69.00m asl . The width of the barrage including powerhouse, sluiceway and navigation locks will be 336m.

The supply, object of this specification, consists in :

- supply of steel waterstops,
- supply of elastomeric waterstops,
- supply of plant equipment, accessories and consumables for site assembly,
- technical assistance and services.

2. QUALITY STANDARDS

The publications listed below form part of these Specifications. Concrete materials, testing methods and procedures shall conform to the applicable standards of DIN. The applicable standards of ASTM, ACI and/or those contained in the US Bureau of Reclamation "Concrete Manual" shall be applied when corresponding DIN standards are not published.

Specific quality standards regarding materials and practice that are applicable to the waterstops works of the project include but are not limited to the following:

DIN: Deutsche Industrie Norm	Contents of Standard
ZTV-W	Control of cracking in concrete structures
DIN 1045	Concrete, reinforced and prestressed concrete structures. Quality assurance systems for concrete construction
DIN 18197 E	Waterproofing of joints in concrete constructions with waterstops
DIN 1048	Testing concrete
DIN 18195-8/9	Water-proofing of buildings - part 8 : Water-proofing over joints for movements
ZTV - RISS	Technical specification for polyurethane grout and related injection methods

DIN: Deutsche Industrie Norm	Contents of Standard
DIN 7865	Elastomeric preformed gaskets for sealing of joints in concrete

In case of conflict between the present specifications and the above, the present specifications shall take precedence.

3. JOINTS IN CONCRETE STRUCTURES

3.1. Construction Joints

General

1) Concreting shall be carried out continuously up to the construction joints, the arrangement and positions of which shall be as shown on the Construction Drawings, or as approved by the Employer. Also, whenever concreting is forced to cease and placed concrete has become so hard that it does not permit the entry of a vibrator, a new construction joint shall be formed conforming to these Specifications.

2) The position of certain construction joints shown on the Construction Drawings as mandatory shall not be altered. The Contractor may propose for approval different locations of other construction joints for reasons of concrete placement. Necessary rearrangement of steel reinforcement arising from such modifications shall be to the Contractor's debit.

3) Construction joints shall be approximately horizontal or vertical. The joints shall appear as straight lines, produced by a board fixed to the formwork, at exposed faces.

4) The surface of construction joints upon or against which new concrete is to be placed and to which new concrete is to adhere shall be clean, rough, and free of water when covered with fresh concrete. The laitance, loose or defective concrete and foreign material shall be removed from the surface of existing concrete. The previous concrete lift shall be saturated by water for approximately 24 hours, but shall be surface dry when the successive lift is placed.

5) For horizontal construction joints, the surface of the hardened concrete shall be scabbled (chiselled) and all loose material shall be removed. Before placing new concrete, the surface shall be thoroughly cleaned with air-water jet, to remove all laitance, scum and foreign material.

6) For vertical construction joints, formwork shall prevent the loss of fine material from the concrete after placing. After removal of the formwork, the fresh concrete surface shall be scabbled (chiselled), and honeycombs - if any - be completely removed. Before placing new concrete, the surface shall be thoroughly cleaned by air-water jet.

7) If the Contractor wishes to essentially deviate from the above, he shall submit a detailed description of the methods applied in preparation of the surface of construction joints, for approval be the Employer.

8) Water used in cutting, washing and rinsing of concrete surfaces shall not cause stain, discolouring or affect exposed surfaces of the structures.

9) Where indicated on the Construction Drawings, construction joints will be formed with central shear keys. The Contractor's proposed method for forming such keys shall be subject to the approval by the Employer.

10) Steel sheet waterstop 40 cm wide and 3 mm thick shall be placed at all construction joints which are required to be watertight except in places where elastomere waterstops for vertical construction joints are approved by the Employer. Steel sheet shall comply with the requirements of ASTM A366M, unexposed class. Horizontal steel sheet waterstops in vertical joints shall be installed with sufficient slope to avoid air trapping with the formwork.

11) Steel sheet waterstops at horizontal construction joints shall be gas shield welded to lateral steel flanges of connecting elastomeric waterstops. Alternatively, steel sheet waterstops may be bolted to the lateral steel flanges of connecting elastomeric waterstops with a 3 mm raw rubber sealing strip in between. Details proposed by the Contractor shall be subject to approval by the Employer.

Cold Joint

1) A cold joint is an unplanned joint which is the result of hardening of the concrete surface before the next batch is placed against it. Cold joints are undesirable and should be avoided.

2) In the event of equipment breakdown, or other unforeseen prolonged interruption the continuation of placing may be not allowed. When such an event occurs, and the unconsolidated concrete may harden to the extent that later vibration would not fully consolidate it, the Contractor shall immediately consolidate such concrete to a stable and uniform slope.

3) If delay in placement is short and it is still feasible to penetrate the underlying concrete, placement shall resume with care to thoroughly penetrate and re-vibrate the concrete surface placed before the delay.

4) If the concrete cannot be penetrated with the vibrator, the cold joint shall be treated as a construction joint, if the design requirements tolerate such joint. If such joint would impair the structural integrity of the structure, as determined by the Employer, the concrete, or a part of it, shall be repaired or removed as directed by the Employer.

Construction Joints for Stage Concreting

1) Constructions joints for stage concreting are joints, or joint systems where infill concrete or bays shall not be placed before one or several months after placing of the first stage concrete.

2) Such joints are provided for installation of major and minor equipment pieces in the floor and walls in certain structures and may be shown on the Tender Drawings.

3) Waterstops shall be provided in construction joints for stage concreting, where shown in the construction drawings or otherwise directed by the Employer.

4) When shown on the construction drawings or when necessary, as determined by the Employer, surfaces of construction joints for stage concreting shall be cleaned and roughen by bush-hammering after removal of the forms and prior to placement of the second stage concrete. These surfaces may be penetrated by a number of reinforcement bars.

3.2. Expansion Joints

General

1) Expansion joints in the concrete structures shall be constructed at such locations and to such dimensions as shown on the Construction Drawings. The Contractor shall supply and install the various joint components as specified herein, as shown on the Construction Drawings and in accordance with the manufacturers recommendations.

2) No fixed metal embedded in the concrete shall be continuous through an expansion joint except where expressly shown on the Construction Drawings.

3) Expansion joints are joints provided in concrete structures to prevent transfer of forces from structure to structure or to accommodate volumetric changes due to temperature rise. Expansion joints may be provided with the following elements as shown on the Construction Drawings:

- Elastomeric waterstop
- Steel dowels
- Concrete shear keys
- Preformed expansion joint filler panels
- Bond breaker bituminous coating
- Joint sealer
- Elastomeric strips

Materials

1) Elastomeric waterstops shall comply with the requirements of DIN 7865 and shall be, as shown on the Drawings, 2235 RMD and 2345 RMD with lateral steel flanges, as supplied by Gumba of Germany, or approved equivalent. Elastomeric waterstops and strips shall have the following properties:

Tensile strength	> 10 N/mm^2
Elongation at break	> 380%
Tear propagation strength	> 8 N/mm²

2) Steel dowels shall be about 40 cm long plain steel bars conforming to ASTM A615M, Grade 400, diameter approximately 25 mm. Prior to placing the subsequent pour, each bar shall be wrapped or coated to half the length with bituminous materials acceptable to the Employer. As an alternative to such coating a galvanised mild steel or PVC cap may be used.

3) Preformed expansion joint filler panels shall consist of expanded polystyrene, 30 mm thick, with a specific weight of approximately 20 kg/m^3. They shall be waterproof and shall not absorb water. Alternative materials complying with the requirements of DIN 18107 E may be proposed by the Supplier for the Contractor's approval.

4) Bond breaker bituminous coating shall be used to facilitate independent movement between two units that would otherwise behave monolithically and shall consist of 2 layers of a product similar to IGOL-T as supplied by Sika Switzerland, or equivalent.

5) Joint sealer shall be a sealing cord based on closed-cell elastomers with a smooth outer skin and a circular cross-section as supplied by Fermadur of Germany, or approved equivalent, and shall have the following properties:

Tensile strength	> 2 N/mm^2	DIN 4060
Breaking strain	> 350%	DIN 4060

Construction

1) Waterstops shall be joined and fixed in place in accordance with manufacturer's recommendations to form a continuous watertight barrier. All cross-pieces, T-pieces and corner-pieces shall be factory produced. All remaining linear joints shall be hot vulcanised on site in accordance with the manufacturer's recommendations. All splices shall be neat with the ends of the joined waterstops in true alignment. A manufacturer's own specialist shall be appointed for on-site training of the Contractor's labour until such labour becomes skilled to the satisfaction of the manufacturer and the Employer. A mitre-box guide and portable knife shall be provided for cutting the ends to be joined to insure good contact between joined surfaces. The Contractor shall supply all necessary supports and ties required for placing the waterstop and shall position it so that its central axis coincides with the joint centre. Care shall be taken that waterstop does not bend or deflect during concreting. Concrete adjacent to the waterstop shall be thoroughly worked to ensure full contact with the waterstop but without damaging it. Prior to commencement of concrete placing, the waterstops placed shall be inspected by the Employer.

2) Before casting the second part of an expansion joint, the whole surface will be covered with preformed expansion joint filler panels as shown on the Construction Drawings. The panels shall be cut to the size and shape of the joint and shall be glued (or clamped by methods to be approved by the Employer) onto the joint face and tightly joined. Holes and joints in the filler panels shall be filled with mastic to prevent passage of mortar or concrete from one side to the other. Particular care shall be taken to ensure that all surfaces of the shear keys are covered.

3) Before applying the joint sealer, the joint shall be raked out to a depth as specified. All laitance, dirt, oil and foreign matter shall be removed from the joint by sandblasting, compressed air, grinding discs, or other effective means, and the concrete surfaces coated with an approved suitable primer as recommended by the sealer manufacturer. Joint sealer shall be placed after the concrete curing period in accordance with manufacturer's instructions. The concrete surface temperature shall not be higher than 30°C at the time of placing unless otherwise

approved, and the concrete shall be surface dry. After placing, the sealer shall be protected from the effects of water for a period of at least 10 hours.

4) Joint sealer that becomes unbounded from the concrete, or cracks, or shows any other defects before final acceptance of the work, shall be replaced by the Contractor.

5) Bituminous coating or elastomeric strips of adequate thickness shall be used as bond breaker on the inclined surfaces of the shear keys where expansion joint filler is not used. Details shall be shown on Construction Drawings.

4. TESTS DURING THE PERFORMANCE OF THE WORKS

Waterstops

1) All types of waterstops shall be tested in a recognised laboratory prior to shipment to the site. Test specimens shall be furnished by the manufacturer and the tests shall be carried out at the place of manufacture.

2) Waterstops shall be tested for their tensile strength, elongation, duration, water absorption, specific gravity, effect of alkali and impact resistance.

PART II - Particular Technical Specifications

1. SCOPE OF SUPPLY

1.1. General

The supply, object of this specification, consists in :

- supply of steel waterstops,
- supply of elastomeric waterstops,
- supply of plant equipment, accessories and consumables for site assembly,
- technical assistance and services.

1.2. Construction Joints

1) Steel sheet waterstops (101) 40 cm wide and 3mm thick shall be placed at all construction joints which are required to be watertight except where elastomere waterstop for vertical construction joints (102) are required (cf. construction drawings). Steel sheet shall comply with the requirements of ASTM A366M unexposed class. Horizontal steel sheet waterstops in vertical joints shall be installed with sufficient slope to avoid air trapping with the formwork.

2) Steel sheet waterstops at horizontal construction joints shall be gas shield welded to lateral steel flanges of connecting elastomeric waterstops. Alternatively, steel sheet waterstops may be bolted to the lateral steel flanges of connecting elastomeric waterstops with a 3 mm raw rubber sealing strip in between. Details proposed by the Contractor shall be subject to approval by the Employer.

1.3. Expansion Joints

1) Expansion joints are joints provided in concrete structures to prevent transfer of forces from structure to structure or to accommodate volumetric changes due to temperature rise. Expansion joints may be provided with the following elements as shown on the Construction Drawings:

- Elastomeric waterstop,
- Steel dowels,
- Concrete shear keys,
- Preformed expansion joint filler panels,
- Bond breaker bituminous coating,
- Joint sealer,
- Elastomeric strips.

2) No fixed metal embedded in the concrete shall be continuous through an expansion joint except where expressly shown on the Construction Drawings.

2. APPROVAL OF MATERIALS AND CERTIFICATES

2.1. Suppliers Environmental Certification

Manufacturers are informed that where materials and equipment of equal quality and prices are available from more than one supplier, preference shall be given to those suppliers certified as implementing environmental management systems under ISO 14000, BS 7750, or EMAS.

2.2. Mill Certificates

Manufacturer's mill certificates and laboratory certificates are required.

2.3. Free of charge samples

Free of charge samples of all types of material and accessories shall be provided by the Manufacturer with the Quotation.

3. QUALITY STANDARDS

Materials, testing methods and procedures shall conform to applicable standards of DIN.

3.1. Use of Waterproofing

"Use of Waterproofing and Other Barrier Systems for Concrete" according to **DIN 18195-8/9.**

3.2. Material

Elastomer Waterstop shall conform to applicable standard **DIN 7865 part 1.**

3.3. Design, Dimensions and Tolerances

Design, Dimensions and Tolerances as specified in **DIN 7865 part 1** shall be applied**.**

The waterstop to be supplied are as shown by the Construction Drawings, i.e. typical products from GUMBA of Germany, or approved equivalent, and listed below :

- 102 : FS 300R (with lateral steel flange) - elastomer waterstop in vertical construction joints,
- 103 : FM 320 R (with lateral steel flange) - elastomer waterstop in expansion joints (retaining wall),
- 104 : FMS 500R-MSU (with closed cell foam rubber and lateral steel flange) - elastomer waterstop in contraction / expansion joints,
- 105 : FMS 500R (with lateral steel flange) - elastomer waterstop in expansion joints.

(Note : "102", "103", "104", and "105" denote the designation adopted by the Designer on the Construction Drawings).

3.4. Physical properties

Physical properties shall conform to applicable standard **DIN 7865 part 2.**

Elastomeric waterstop and strips shall have the following properties, according to applicable standard **DIN 7865** :

- Tensile strength **> 10 N/mm²**
- Elongation at break **> 380 %**
- Tear propagation strength **> 8 N/mm²**
- Dimensional stability when exposed to hot bitumen: **No change in shape**
- Metal adhesion: **Structural fracture in the elastomer**

4. TESTING

All types of waterstops shall be tested in a recognised laboratory prior to shipment to the site. Test specimens shall be provided by the manufacturer and the tests shall be carried out at the place of manufacture. Waterstop testing shall conform to applicable standard **DIN 7865 part 2.**

Waterstops shall be tested for their :

- tensile strength,
- elongation at break,
- tear propagation strength,
- duration,
- water absorption,
- specific gravity,
- effect of alkali
- impact resistance.

5. EQUIPMENT / MATERIAL

5.1. Equipment

Two pieces of Vulcanization Unit with 2 pieces of moulds for site vulcanisation for each type of elastomer waterstop profile are required.

5.2. Tools

Special knifes, Rollers and Taping Rods shall be provided for cutting the ends to be joined to insure good contact between joined surfaces.

5.3. Accessories and Consumables

Accessories and consumables shall be provided according to Manufacturers instructions.
The manufacturer shall fill in the units and the quantities of the B.O.Q. .

Expected accessories include :

- Vulcanizing Solvent,
- Adhesion Foil,
- Bonding Agent,
- Bonding Agent for steel rubber connection incl. primer,
- Talcum for steel rubber connections incl. primer,
- Bentonite Tape for steel rubber connection incl. primer,
- Waterstop clips for elastomer waterstop,
- Steel connectors.

The Manufacturer shall especially inform the Contractor of each accessory environmental impacts.

6. DELIVERY/STORAGE

Quality certificates shall be enclosed with each delivery, quotation or offer.

The Manufacturer shall specify site storage conditions and site storage duration according to constraints run into site.

The Manufacturer shall specify means and form of delivery on site (packing, rolls, specified lengths, form pieces and systems of delivery).

7. SAFETY AND ENVIRONMENTAL MATERIAL DATA SHEET

7.1. Environment

The Manufacturer shall inform the Contractor of waterstop joint environmental impacts.
The Manufacturer shall especially inform the Contractor of accessories environmental impacts (including vulcanizing equipment, vulcanising solvent, bonding agent, bentonite tape, etc.).

The Manufacturer shall provide the Environmental Material Data Sheet.

Manufacturers are informed that where materials and equipment of equal quality and price are available from more than one supplier, preference shall be given to those suppliers certified as implementing environmental management systems under ISO 14000, BS 7750, or EMAS.

7.2. Safety

The Manufacturer shall inform the Contractor of safety risks and safety measures to be taken on site during waterstops setting up - especially for vulcanisation on site.

The Manufacturer shall provide the Safety Material Data Sheet.

8. TECHNICAL ADVICE AND SERVICE

During all the duration of waterstops work, the Manufacturer shall offer Technical advice for joint design, waterstop material, profiles during the design, construction stages to ensure the correct decision are made.
For all prefabricated pieces, shop drawings shall be made by the Manufacturer. Those drawings are based on the construction drawings and have to be approved by the NHB JV before start of production. In appendix 5 is attached an extract of the Construction Drawings, for reference only.

A Manufacturer's own specialist shall be appointed for on-site training of the Contractor's labour until such labour becomes skilled to the satisfaction of the Employer. After the successful end of the on-site training, labourers shall get a certificate from the manufacturer.

The Manufacturer shall provide a method statement for installation and maintenance of all materials described in the schedule of quantities.
The Manufacturer shall inform the Contractor of recommendations to join and fix in place waterstop to form a continuous watertight barrier - especially for linear joints hot vulcanization on site.

9. PROGRAMME OF DELIVERY

Two deliveries:

- the first one with all order - quantities required,
- a second one with extra-requirements.

Delivery date:

- Material delivery according Contract in October 2004,
- Extra quantities according site requirement 4 weeks after order.

10. SHIPMENT

Shipment CIF to Egyptian port, packing and transportation are included in unit rates.

Appendix 1 - Bill of Quantities

Item	Description	Qty	Unit	Unit Rate [Currency]	Amount [Currency]
1	**Steel Waterstops**				
1.1	**Construction joint waterstop (101)** *Fabrication and delivery of steel sheets* *W=400mm; T=3mm; L= 25m* *Material St 37*	4 000	m	_____	_____
	TOTAL Item 1				_____
2	**Standard Elastomer (Rubber) Waterstops**				
2.2	**Construction joint waterstop (102)** *According DIN 7865 1+2* *Fabrication and delivery of elastomere waterstop joint tape* *Type : FS 310*	300	m	_____	_____
2.3	**Expansion joint waterstop (103)** *According DIN 7865 1+2* *Fabrication and delivery of elastomere waterstop joint tape* *Type : FM 300*	15	m	_____	_____
2.4	**Contraction / Expansion joint waterstop (104)** *According DIN 7865 1+2* *Fabrication and delivery of elastomere waterstop joint tape* *Type : FMS 500*	550	m	_____	_____

Item	Description	Qty	Unit	Unit Rate [Currency]	Amount [Currency]
2.5	**Contraction / Expansion joint waterstop (105)** *According DIN 7865 1+2* *Fabrication and delivery of elastomere waterstop joint tape* *Type : FMS 500*	750	m		
	TOTAL Item 2				
3	**Injection hose**				
3.1	**Injection hose (107)** *According ZTV-RISS* *Delivery of injection hose* *Including rent ends* *Type : WEBAC type 1, Pat.-Nr. 3507806 or similar*	250	m		
3.2	**Injection Material** *According ZTV-RISS* *Delivery of 2-comp. PUR-resin injection material* *Type : WEBAC 1403 or similar*		ℓ		
3.3	**Injection equipment** *One set of equipment to inject PUR-resin according manufacturer instructions*		set		
3.4	**Accessories** *Fixing Clips to fix the hose on the concrete* *Quantities according manufacturer recommendations*				
	TOTAL Item 3				

Item	Description	Qty	Unit	Unit Rate	Amount
				[Currency]	[Currency]
4	**Junctions for Elastomer (Rubber) Waterstops**				
	Fabrication and delivery only Material consumption measured and paid according the related Item 2.				
4.1	**Type 102 vertical edge** *According DIN 7865 1+2* *Fabrication and delivery of elastomer waterstop form pieces* *Shape: 102 vertical edge* *Type : FS 310*	24	Pcs	_____	_____
4.2	**Type 102 vertical T** *According DIN 7865 1+2* *Fabrication and delivery of elastomer waterstop form pieces* *Shape: 102 vertical T* *Type : FS 310*	3	Pcs	_____	_____
4.3	**Type 104 vertical edge** *According DIN 7865 1+2* *Fabrication and delivery of elastomer waterstop form pieces* *Shape: 104 vertical edge* *Type : FMS 500*	20	Pcs	_____	_____
4.4	**Type 104 vertical T** *According DIN 7865 1+2* *Fabrication and delivery of elastomer waterstop form pieces* *Shape: 104 vertical T* *Type : FMS 500*	15	Pcs	_____	_____
4.5	**Type 105 vertical edge** *According DIN 7865 1+2* *Fabrication and delivery of elastomer waterstop form pieces* *Shape: 105 vertical edge* *Type : FMS 500*	12	Pcs	_____	_____

Item	Description	Q' ty	Unit	Unit Rate [Currency]	Amount [Currency]
4.6	**Type 104-105 vertical edge** *According DIN 7865 1+2* *Fabrication and delivery of elastomer waterstop form pieces* *Shape: 104-105 vertical edge* *Type : FMS 500*	8	Pcs	_____	_____
4.7	**Type 104-105 trans** *According DIN 7865 1+2* *Fabrication and delivery of elastomer waterstop form pieces* *Shape: Transition 104-105* *Type : Transition FMS 500*	10	Pcs	_____	_____
4.8	**Type 102-104 trans** *According DIN 7865 1+2* *Fabrication and delivery of elastomer waterstop form pieces* *Shape: Transition 102-104* *Type : Transition FS 310 and FMS 500*	2	Pcs	_____	_____
	TOTAL Item 4				_____

Item	Description	Qty	Unit	Unit Rate [Currency]	Amount [Currency]
5	**Equipment**				
5.1	**Vulcanizing Unit** *With 2 pieces of moulds for site vulcanizations for each type of elastomere waterstops profile (the moulds are exchangeable parts)*	2	Pcs		
	TOTAL Item 5				
6	**Vulcanizing Accessories**				
	According manufacturers instructions. Please fill in the units and the quantities.				
6.1	**Vulcanizing Solvent**				
6.2	**Adhesion Foil**				
6.3	**Bonding Agent**				
6.4	**Bonding Agent** For steel rubber connections incl. primer				
6.5	**Talcum** For steel rubber connections incl. primer				
6.6	**Bentonite tape** For steel rubber connections incl. primer				
	TOTAL Item 6				

Item	Description	Qty	Unit	Unit Rate [Currency]	Amount [Currency]
7	**Accessories**				
	According manufacturers instructions. Please fill in the units and the quantities.				
7.1	**Waterstop Clips for elastomer waterstop** *For fixing elastomer waterstop on formwork or rebar reinforcement*				
7.2	**Steel Connector** *For Steel / Rubber connections*				
	TOTAL Item 7				
8	**Tools**				
8.1	**Special Knifes**	5	Pcs		
8.2	**Roller**	5	Pcs		
8.3	**Taping Rods**	5	Pcs		
	TOTAL Item 8				
9	**Testing Equipment**				
	TOTAL Item 9				

SUMMARY	
Item	**Amount [Currency]**
Item 1	
Item 2	
Item 3	
Item 4	
Item 5	
Item 6	
Item 7	
Item 8	
Item 9	
TOTAL	

Appendix 2 - List of Alternatives Proposed by the Supplier with codes, rules or specifications

List of alternatives proposed by the suppliers with codes, rules or specifications

CODES RULES OR SPECIFICATIONS N°	DESCRIPTION	
	DEVIATION	PROPOSITION

Company : ……..

Name : ……
Title :……

Appendix 3 - Waterstop Drawings Details

GENERAL NOTES :

- ALL LEVELS GIVEN ON CONCRETE DIMENSION DRAWINGS ARE RELATED TO RAW CONCRETE SURFACES .
- ALL VISIBLE CONCRETE EDGES HAVE TO BE CHAMFERED 2 cm BY 2 cm . (see also typical Detail shown on this Drawing)

CONCRETE FINISHING WORKS

Finishes For Unformed Surfaces

U-CJ Finish ▽ – Surfaces of horizontal construction joints. The surface shall be scabbed (chiselled) and all loose material shall be removed. Before placing new concrete the surface shall be thoroughly cleaned with air and water jet to remove all laitance, scum and foreign matter.

U1 Finish ▽ – This finish applies to surfaces that will be covered by fill material. Finishing shall consist of sufficient levelling and screeding to produce even uniform surfaces.

U2 Finish ▽▽ –This finish applies to surfaces that will be covered by floor covering materials and to surfaces which will not be permanently exposed to view. Finishing shall consist of sufficient levelling and screedfng to produce even uniform surfaces.

U3 Finish ▽▽▽ –This finish applies to the concrete surfaces of exposed decks or slabs and for surfaces in contact with flowing water. Floating shall be performed by hand or power driven equipment to produce a dense, smooth uniform surface free of blemish, ripples and trowel marks.

Finishes For Formed Surfaces

F-CJ Finish ▼ – This finish is for vertical construction joint surfaces. Formwork may be sawn boards or other suitable material which will prevent the loss of fine material from the concrete being placed. After removal of the formwork the surface shall be scabbed (chiselled), honeycombs are to be removed completely. Before placing new concrete the surface shall be thoroughly cleaned with air and water jet.

F1 Finish ▼ –This finish is for surfaces which are concealed from view, including surfaces upon or against which backfill or concrete is to be placed and block-outs for equipment embedding or other parts which are to be built in. Formwork may be sawn boards. The surface shall be free from voids, honeycombs or other large blemishes.

F2 Finish ▼▼ –This finish is for surfaces which are permanently exposed to view, formed surfaces of expansion and contraction joints. Forms to provide a class F2 finish shall be faced with wrought tongued and grooved boards with square edges arranged in uniform pattern and close jointed or with suitable sheet material. Joints between boards or panels shall be horizontal and vertical.

F3 Finish ▼▼▼ –This finish is for surfaces which will be in contact with flowing water. The standard of finish required is similar to F2 finish, but with no surface bubbles or holes larger than 3mm diameter allowed, and with more stringent tolerance requirements.

TABLE OF SURFACE TOLERANCES

Specified Finish	Permissible Irregularities	
	Abrupt	Gradual
F-CJ, U-CJ	10 mm	20 mm
F1, U1	10 mm	10 mm
F2, U2	5 mm	10 mm
F3, U3		
Offset parallel to flow direction	5 mm	10 mm
Offset perpendicular to flow direction	3 mm	6 mm

TABLE OF CONCRETE CLASSES (ACC. TO M.O.U)

CONCRETE CLASS ACC. TO DIN 1045	max. AGGREGATE SIZE	APPLICATION
B15	25 mm	Blinding concrete
B25	50 mm	Mass concrete
B30	25 mm	Structural concrete for members smaller than 2 m thick
B30	19 mm	2nd stage concrete for cross-sectional areas ≤ 1.5 m2
B30	25 mm	2nd stage concrete for cross-sectional areas > 1.5 m2
B35	25 mm	Selected structural elements with higher stress
B35	19 mm	Pre-cast elements

EMBEDDED PARTS & MISCELLANEOUS METAL WORK

Symbols/explanations

101 No. of Embedded Part, to be supplied & installed by LOT1 Contractor

201 No. of Embedded Part, to be supplied by Lot2 Contractor and to be installed by LOT1 Contractor. If not otherwise indicated, the tolerances for the embed. parts are +/- 2cm in all directions

301 No. of Embedded Part, to be supplied by Lot3 Contractor and to be installed by LOT1 Contractor. If not otherwise indicated, the tolerances for the embed. parts are +/- 1.5cm in all directions

401 No. of Embedded Part, to be supplied by Lot4 Contractor and to be installed by LOT1 Contractor

List of Parts & Miscellaneous Metal Work

101 metal sheet waterstop 400mm/3mm, St 37

102 elastomer waterstop (DIN7865) "GUMBA FS 300R" or equivalent

103 elastomer waterstop (DIN7865) "GUMBA FM 320R" or equivalent

104 elastomer waterstop (DIN7865) "GUMBA FMS 500R-MSU" or equivalent (with closed cell foam rubber)

105 elastomer waterstop (DIN7865) "GUMBA FMS 500R" or equivalent

107 injection hose, "WEBAC" type 1, Pat.-Nr. 3507806 or equivalent for "WEBAC" 1403, 2-comp. PUR-resin injection

110 Sluiceway Piers, pressure steel door

111 Powerhouse, manhole at pressurized dewat. pump pit

112

113 steel gratings

114 checkered plate hatch covers

115 steel ladder (without safety cage)

116 steel ladder (with safety cage)

117 steel ladder (with anti-fall safety device)

118 handrails at platforms, El. 69.00/70.00

119 handrails at staircases and landings

120 Navigation Lock, monorail (lifting equipment for pump removal)

121 Powerhouse, monorail (lifting equipment for pump removal)

122 1 ton hook, St 37

125 Guard Tower/Public Road Bridge steel platform, El. 77.92

126 pipe/cable trench steel covers

130 Navigation Lock, edge protection, type A

131 Navigation Lock, edge protection, type B

132 Navigation Lock, edge protection, type C

133 Navigation Lock 2 – u/s Head, vertical steel sliding strip

134 Navigation Lock 1+2 – vertical steel sliding strip

135 Navigation Lock, recessed bollard

136 Navigation Lock, edge bollard

137

140 Navigation Lock, standard steel ladder

141 Navigation Lock, hand grip for standard steel ladder

142 Navigation Lock, recessed steel ladder

143 Navigation Lock, hand grip for recessed steel ladder

144 Navigation Lock, checkered plate hatch cover with hinge & arrester

145 Navigation Lock, end marking

150

155

160 Powerhouse El. 70.00, removable roof steel covers

170 pore pressure cells acc. to P.T.S. – Section 6

171 pore pressure cells, cable conduit

178 steel pipe DN50

179 steel pipe DN100

180 Drainage, cast iron pipe DN200

181 Drainage, cast iron pipe DN100

182 Drainage, cast iron pipe DN150

183 Drainage, PVC pipe DN50

184 Drainage, PVC pipe DN100

185 Drainage, PVC pipe DN150

186 Drainage, PVC pipe DN250

187 Navig. Locks, Filling/Emptying System dewatering pipe

188 Floor drain DN100

189 Floor drain DN150

190 Public Road Bridge, bridge drain DN150

191 Public Road Bridge, steel plate 470/470/60 base plate for hydr. jack

192 Main Gantry Crane Beam, steel plate 300/300/40 base plate for hydr. jack

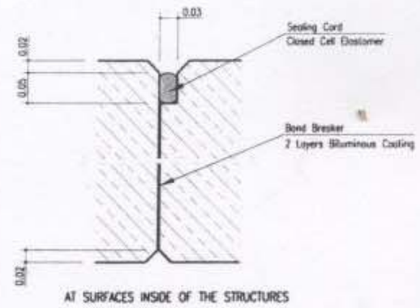
195

196 cable conduit DN40

197 cable conduit DN100

198 cable conduit DN150

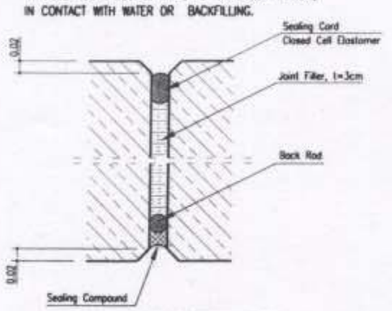
AT OUTER SURFACES PERMANENTLY EXPOSED TO VIEW, IN CONTACT WITH WATER OR BACKFILLING.



AT SURFACES INSIDE OF THE STRUCTURES

TYPICAL CONTRACTION JOINT FINISHING DETAIL

AT OUTER SURFACES PERMANENTLY EXPOSED TO VIEW, IN CONTACT WITH WATER OR BACKFILLING.



AT SURFACES INSIDE OF THE STRUCTURES

TYPICAL EXPANSION JOINT FINISHING DETAIL

APPROVED FOR CONSTRUCTION

REF. MWRI LETTER NO.: 2982/202 DATE: 29.10.03

rev.	description	drawn	checked	date
D	modified as indicated	Wa. Za.	ZANKE	30.03.0
C	Table of Concrete Classes modified.	Wa. Za.	ZANKE	06.03.0
B	approved by MWRI	Wa. Za.	ZANKE	30.11.0
	List of embedded parts updated.			
A	FIRST ISSUE	Wa. Za.	Zonke	22.09.0

NEW NAGA HAMMADI BARRAGE AND HYDROPOWER PLANT
PROJECT IMPLEMENTATION UNIT
MWRI – MEE

TASK B – CONSTRUCTION DESIGN

Naga Hammadi Barrage Development Consultants

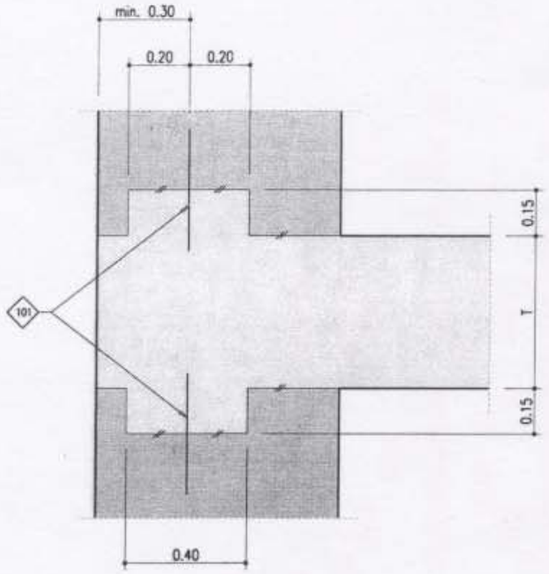
LAHMEYER INTERNATIONAL · ELECTROWATT-EKONO Joakko Poyry Group · SOGREAH

EMPLOYERS DRWG. NO.:

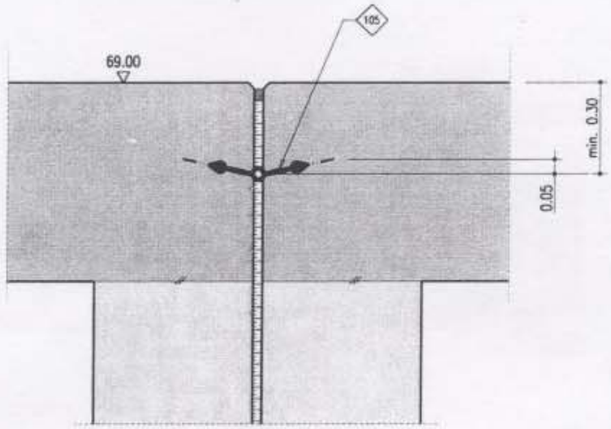
GENERAL NOTES

CONCRETE DIMENSION DRAWING

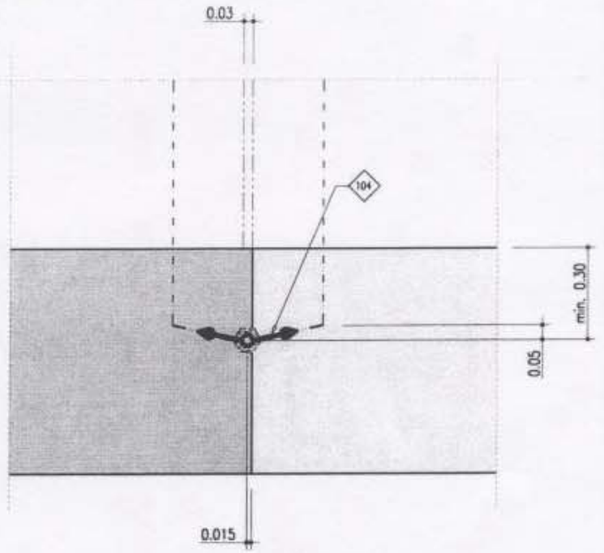
prepared:	Wa. Za.	20.02.03	SCALE: (A1)	DRWG. NO.:	REV.
checked:	Zonke	20.02.03		C-C C 00 2001	D
approved:	Dr Kotb	20.02.03			



VERTICAL SECTION
TYP. SITUATION: WALL/SLAB
HORIZ. CONSTR. JOINT



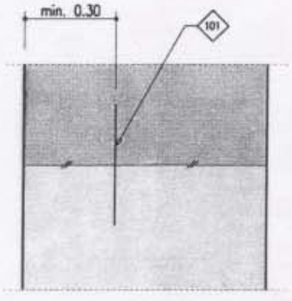
VERTICAL SECTION
TYP. SITUATION: SLAB
EXPANSION JOINT



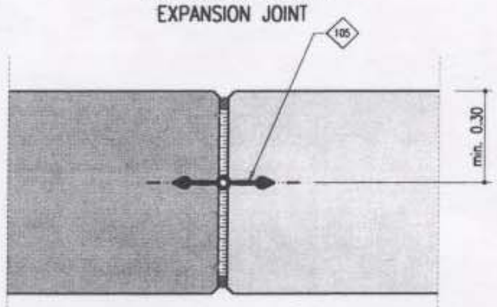
VERTICAL SECTION
TYP. SITUATION: SLAB/WALL
CONTRACTION/EXPANSION JOINT

EMBEDDED PARTS

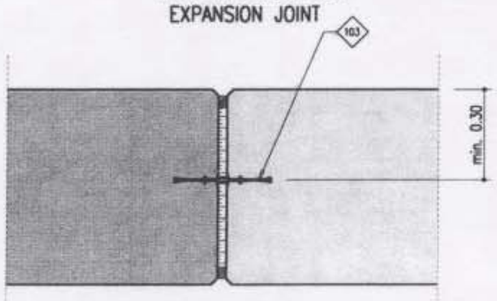
- 101 metal sheet waterstop 400mm/3mm, St 37
- 102 elastomer waterstop (DIN7865) "GUMBA FS 300R" or equivalent
- 103 elastomer waterstop (DIN7865) "GUMBA 2235RMD" or equivalent
- 104 elastomer waterstop (DIN7865) "GUMBA FMS 500R-MSU" or equivalent (with closed cell foam rubber)
- 105 elastomer waterstop (DIN7865) "GUMBA FMS 500R" or equivalent



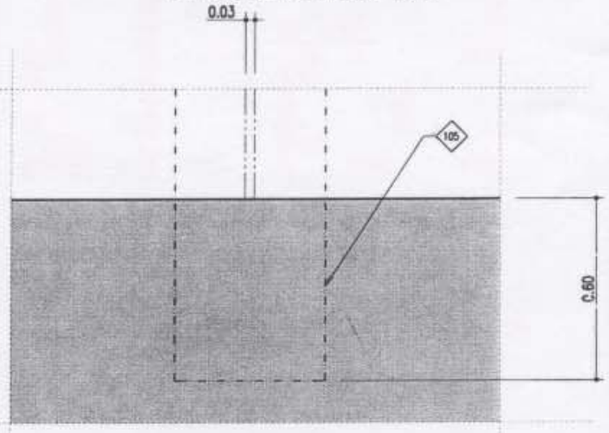
VERTICAL SECTION
TYP. SITUATION: WALL
HORIZ. CONSTR. JOINT



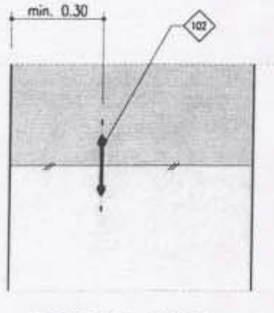
HORIZONTAL SECTION
TYP. SITUATION: WALL
EXPANSION JOINT



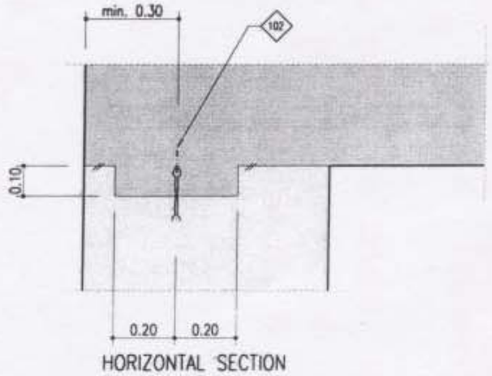
HORIZONTAL SECTION
TYP. SITUATION: RETAINING WALL
EXPANSION JOINT



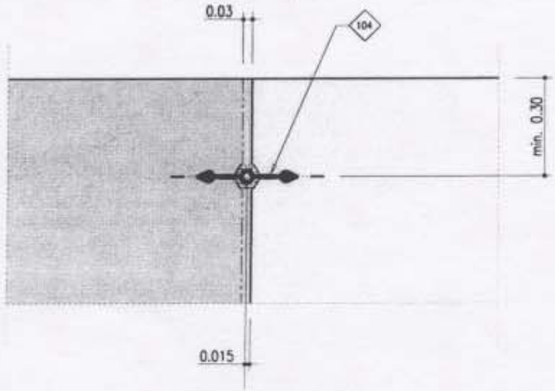
VERTICAL SECTION
TYP. SITUATION: SLAB/WALL
EXPANSION JOINT



HORIZONTAL SECTION
TYP. SITUATION: WALL
VERTICAL CONSTR. JOINT



HORIZONTAL SECTION
TYP. SITUATION: WALL
VERTICAL CONSTR. JOINT



HORIZONTAL SECTION
TYP. SITUATION: WALL
CONTRACTION JOINT

APPROVED FOR CONSTRUCTION
REF. MWRI LETTER NO.: 2982/202 DATE: 29.10.03

rev.	description	drawn	checked	date
A	Approved by MWRI	Selim	Zanke	30.11.03

NEW NAGA HAMMADI BARRAGE AND HYDROPOWER PLANT
PROJECT IMPLEMENTATION UNIT
MWRI – MEE

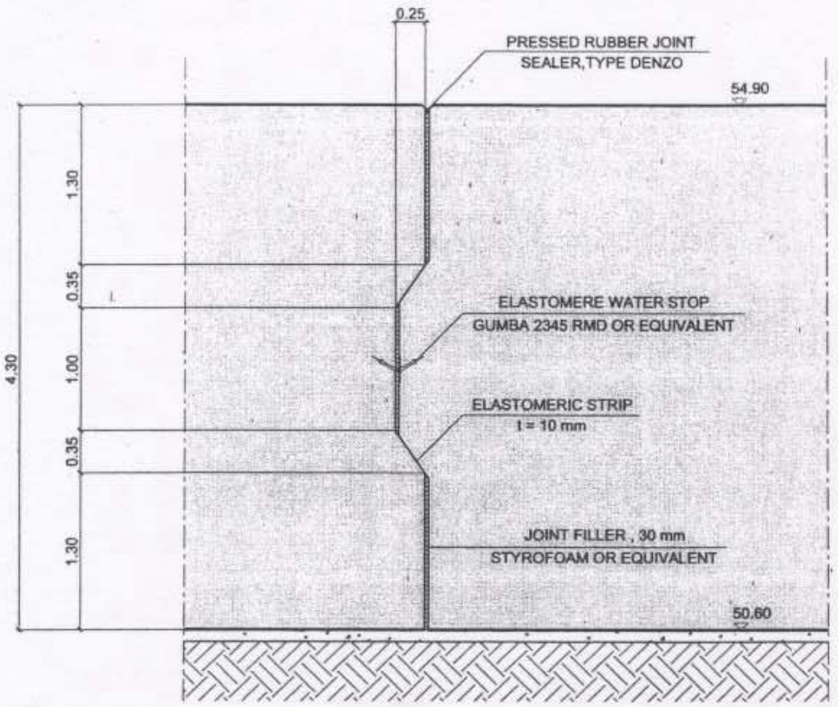
TASK 8 – CONSTRUCTION DESIGN

Naga Hammadi Barrage Development Consultants
LAHMEYER INTERNATIONAL · ELECTROWATT-EKONO Zaakko Pöyry Group · SOGREAH

EMPLOYERS DRWG. NO.:

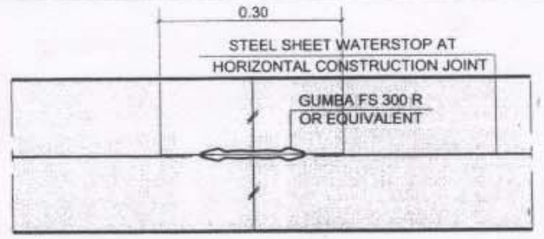
GENERAL
WATERSTOP DETAILS, EMBEDDED PART
Nos. 101, 102, 103, 104, 105

prepared:	Selim	01.07.03	SCALE: (A1)	DRWG. NO.		REV.
checked:	Zanke	01.07.03	1 : 10	C-C S 00 1805		A
approved:	Dr.Kohli	01.07.03				



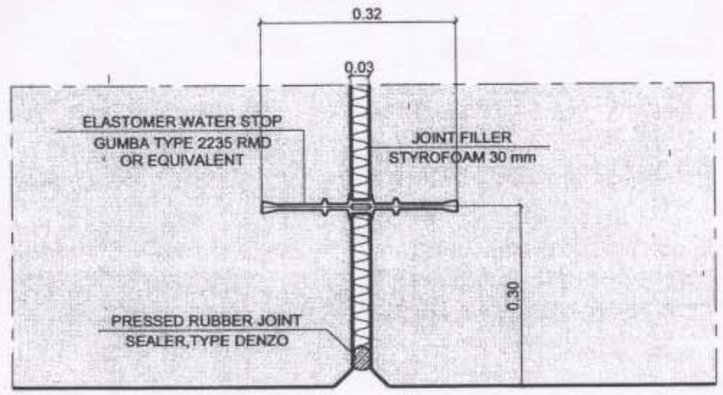
SHEAR KEY AT NAVIGATION LOCK BOTTOM SLAB

TYPICAL FOR ALL BOTTOM SLABS
SCALE 1/50



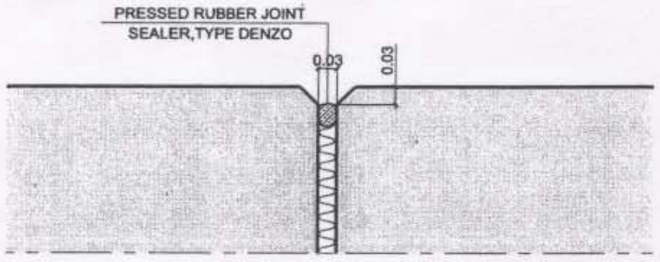
CONSTRUCTION JOINT DETAIL

TYPICAL FOR WATER STOP SEALED VERTICAL JOINT

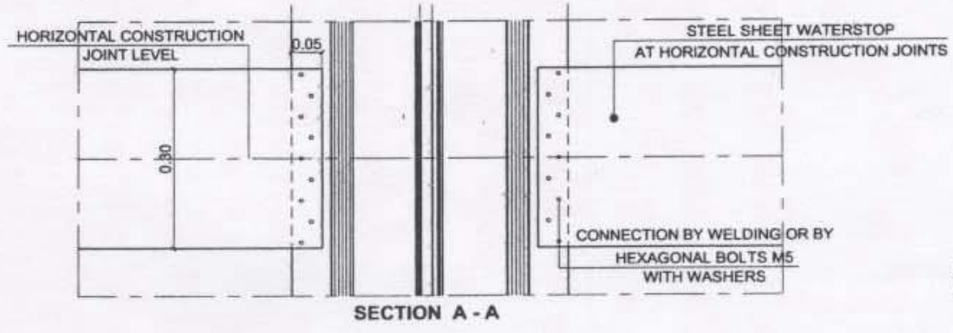


WATERSTOP TYPE II
EXPANSION JOINT DETAIL

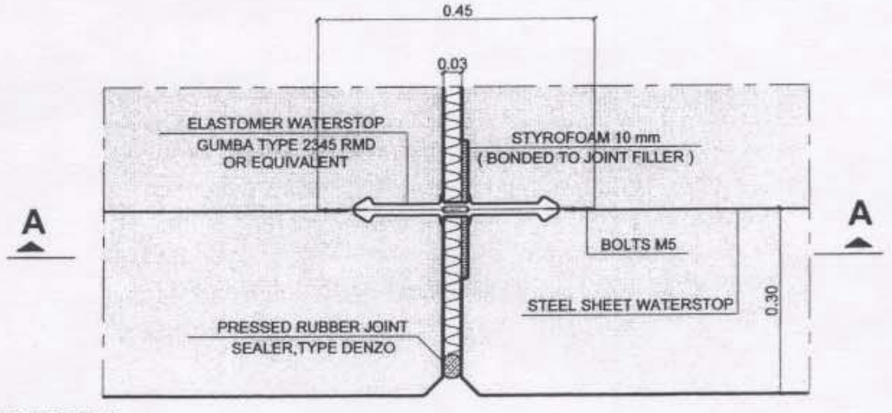
TYPICAL FOR RETAINING WALLS



TYPICAL SECTION IN SLABS



SECTION A - A



TYPICAL SECTION IN WALLS

WATERSTOP TYPE 1
EXPANSION JOINT DETAIL

TYPICAL FOR SLUICEWAY, NAV. LOCK
AND POWERHOUSE

SCALE
0 0.1 0.2 0.3 0.4 0.5 0.6m
(ORIG. SCALE : 1/10)

SCALE
0 0.5 1.0 1.5 2.0 2.5 3.0 m
(ORIG. SCALE : 1/50)

New Naga Hammadi Barrage and Hydropower Plant
Project Implementation Unit
MWRI - MEE

TENDER DESIGN

Naga Hammadi Barrage Development Consultants

SOGREAH

KAPZINSKY 2000

STANDARD DETAILS

WATER STOPS

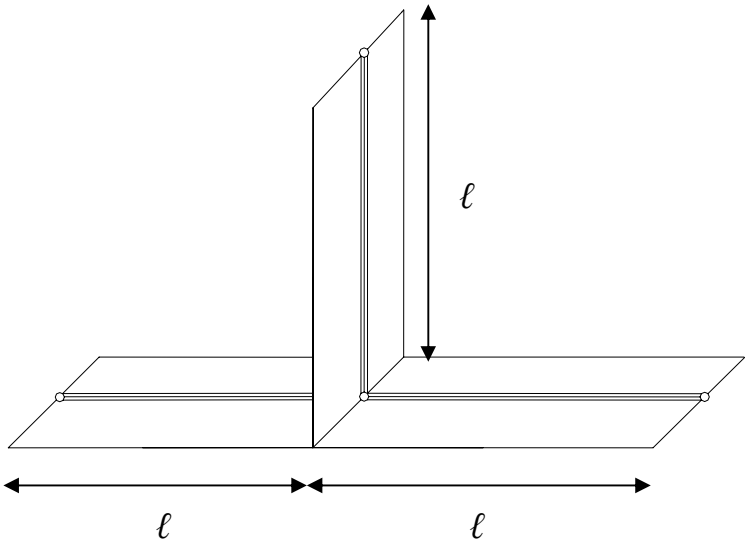
C 20-01

NHB_ENC1\H:\Drawings\Tender\20 Details\C 20-01

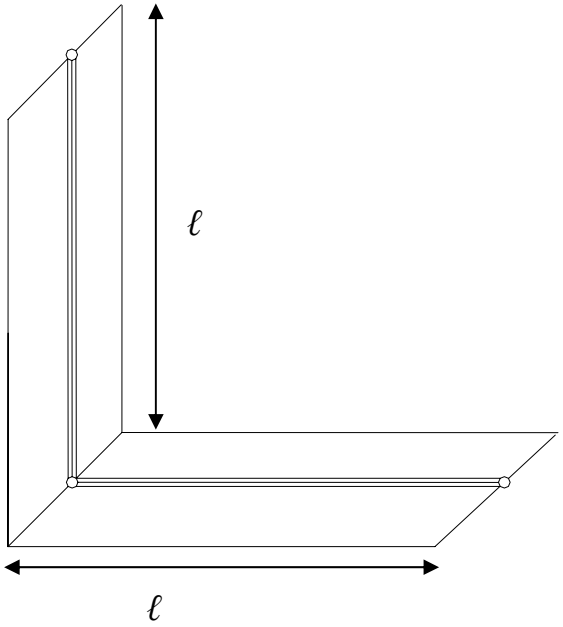
Appendix 4 - Junctions for Elastomer (rubber) Waterstops

102 - JUNCTIONS

102 - VERTICAL T



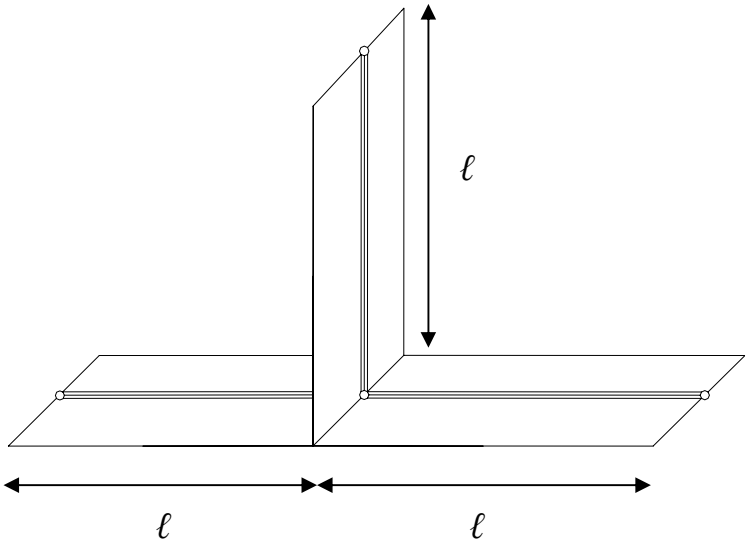
102 - VERTICAL EDGE



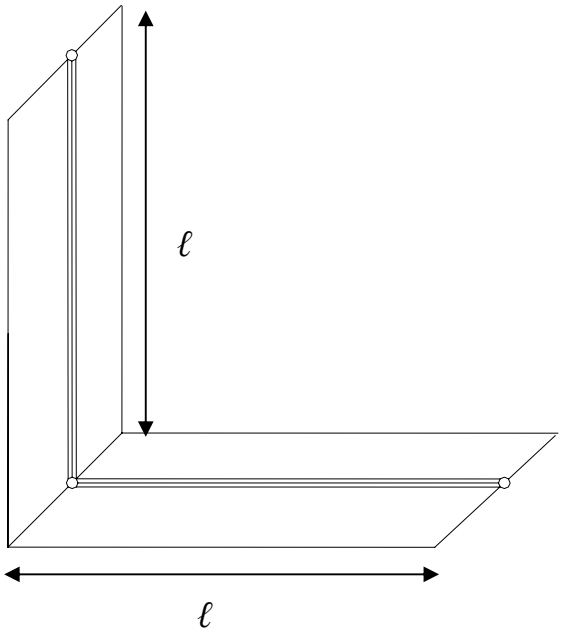
(Length ℓ : according manufacturer recommendations)

104 - JUNCTIONS

104 - VERTICAL T

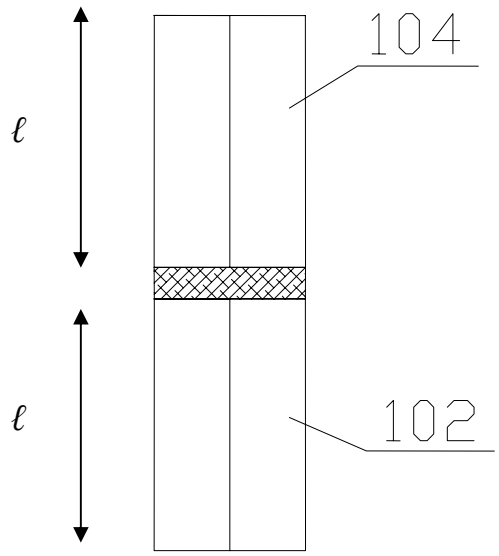


104 - VERTICAL EDGE



(Length ℓ : according manufacturer recommendations)

JUNCTIONS 102 - 104

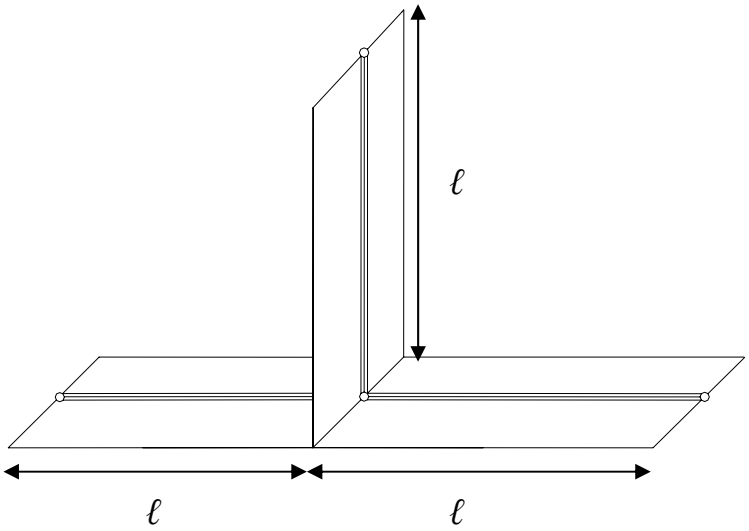


102 - 104 Transition

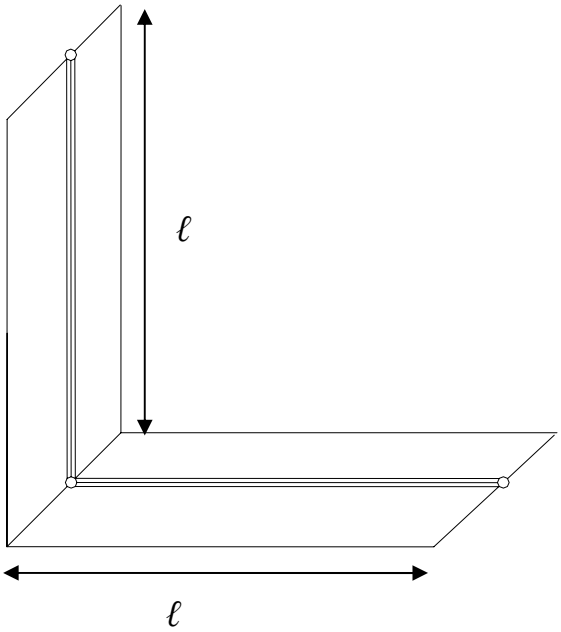
(Length ℓ : according manufacturer recommendations)

105 - JUNCTIONS

105 - VERTICAL T

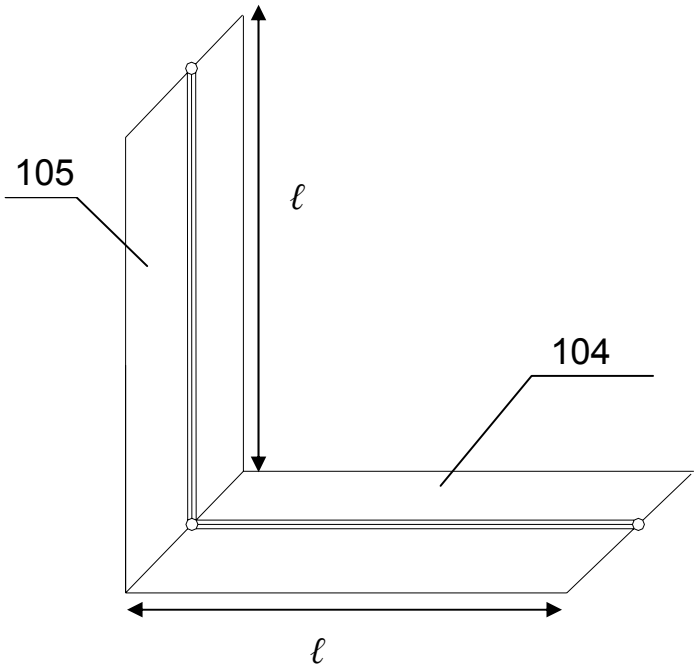


105 - VERTICAL EDGE

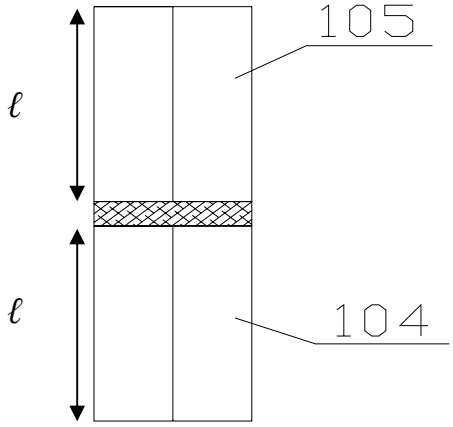


(Length ℓ : according manufacturer recommendations)

JUNCTIONS 104 - 105



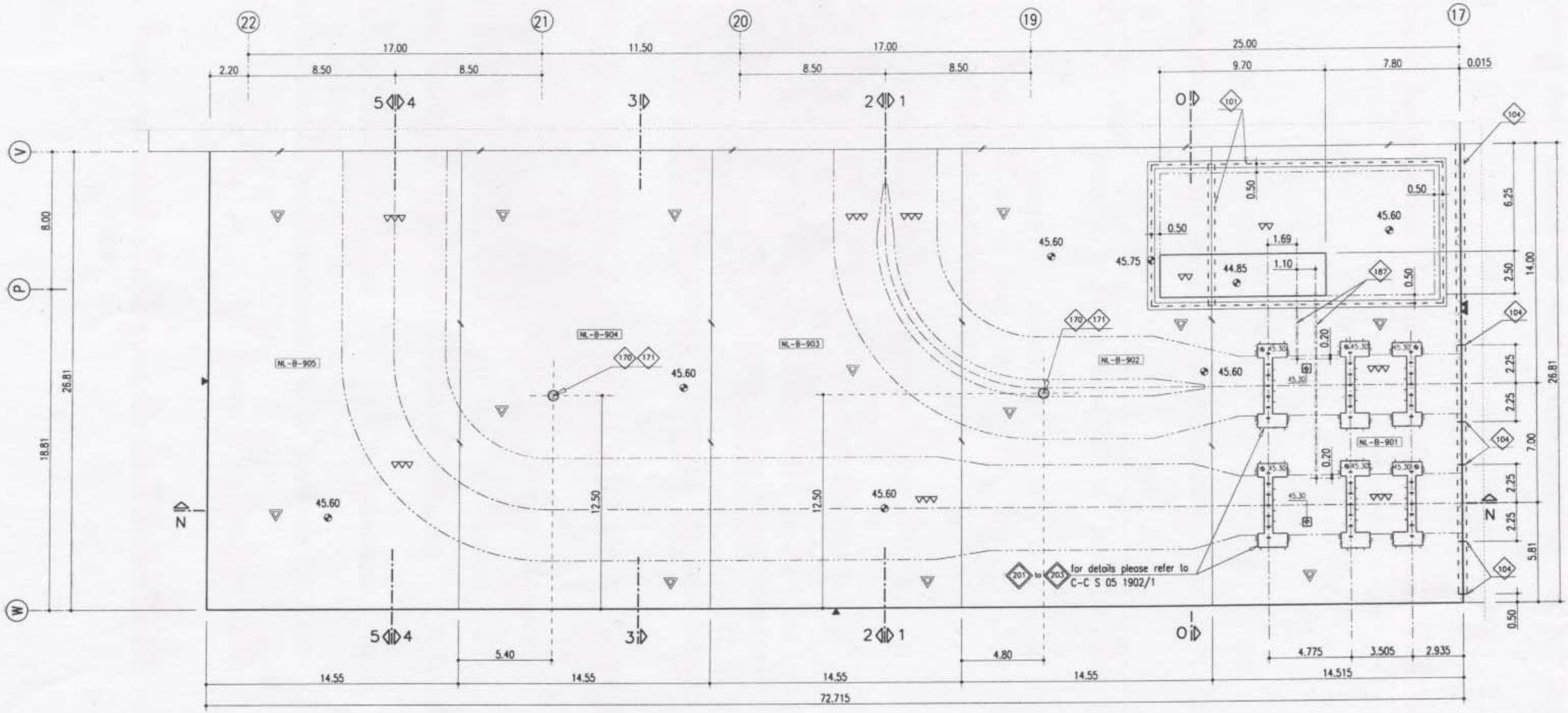
104 - 105 VERTICAL EDGE



104 - 105 Transition

(Length ℓ : according manufacturer recommendations)

Appendix 5 - Construction Drawings



LEGEND

NL-B-901 Coding No. of Concrete Blocks

INSTRUCTION

Nominal Class of Concrete: B 25

Finishes for Unformed Surfaces	Finishes for Formed Surfaces
U-CJ Finish	F-CJ Finish
U1 Finish	F1 Finish
U2 Finish	F2 Finish
U3 Finish	F3 Finish

EMBEDDED PARTS

101 metal sheet waterstop 400mm/3mm, St 37

104 elastomer waterstop (DIN7865) "DUMBA FWS 500R-MSU" or equivalent (with closed cell foam rubber)

170 pore pressure cells acc. to P.T.S. – Section 6

171 pore pressure cells, cable conduit

187 Navig. Locks, Filling/Emptying System dewatering pipe

203 No. of Embedded Part, to be supplied by Lot2 Contractor and to be installed by LOT1 Contractor

COMPLEMENTARY DRAWINGS

C-C C 05 2620	NAVIGATION LOCKS, AXIS S-T, PLAN El. 45.60
C-C C 05 2756	NAVIGATION LOCKS, SECTION M-M, N-N
C-C S 05 1902/1	CULVERT GATE & STOPLOGS, EMBEDDED PARTS 1st STAGE CONCRETE
C-C S 05 1904/1	CULVERT GATE & STOPLOGS, EMBEDDED PARTS 2nd STAGE CONCRETE
C-C S 00 1805	WATERSTOP DETAILS, EMB. PART Nos. 101 TO 105

APPROVED FOR CONSTRUCTION

REF. MWRI LETTER NO.: 441/202 DATE: 28.02.2004

rev.	description	drawn	checked	date
B	approved by MWRI	No. Za.	ZANKI	07.03.04
A	FIRST ISSUE	No. Za.	ZANKI	30.11.03

NEW NAGA HAMMADI BARRAGE AND HYDROPOWER PLANT PROJECT IMPLEMENTATION UNIT
MWRI – MEE

TASK 8 – CONSTRUCTION DESIGN

Naga Hammadi Barrage Development Consultants

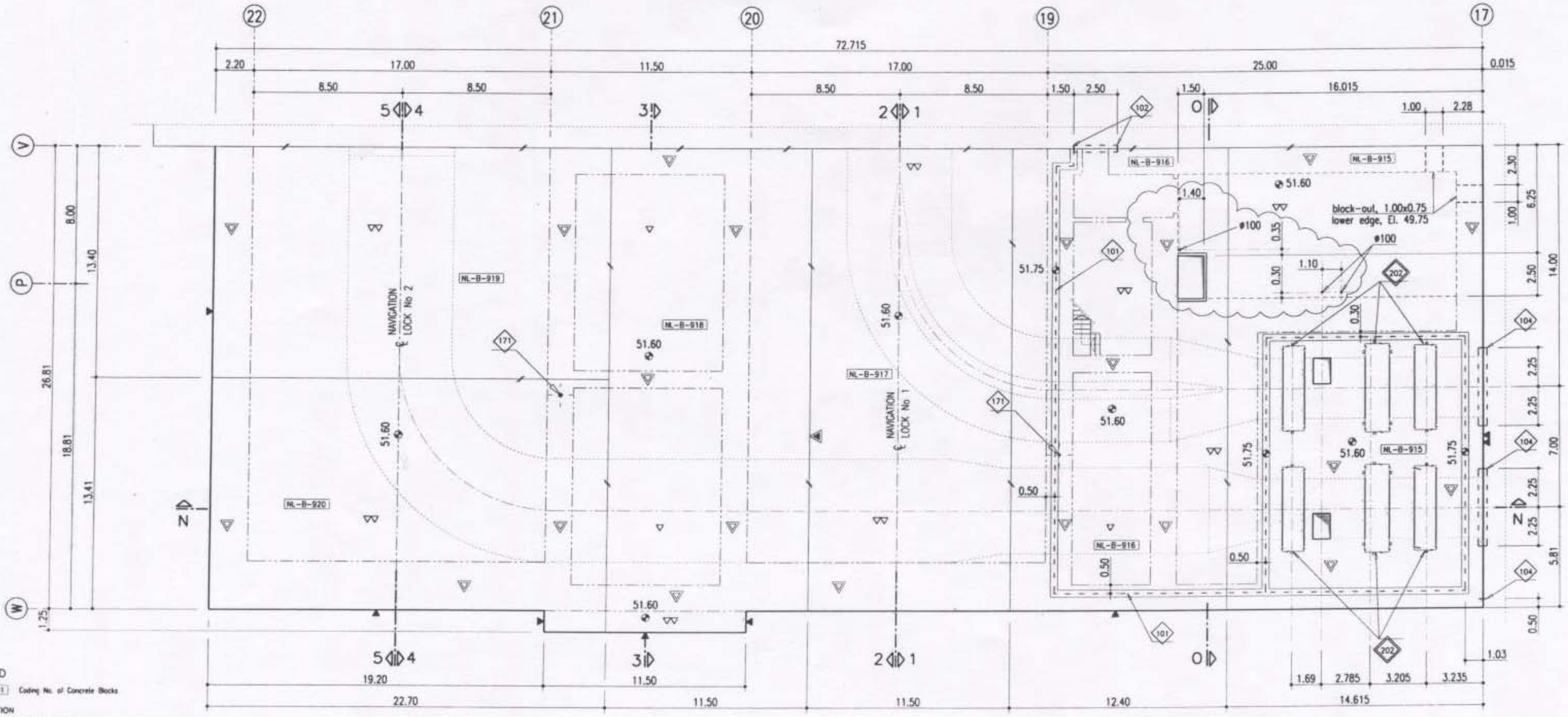
LAHMEYER INTERNATIONAL ELECTROWATT-EKONO Joakko Pöyry Group SOGREAH

EMPLOYERS DRWG. NO.:

NAVIGATION LOCK
AXIS V TO AXIS W
PLAN AT El. 45.60

CONCRETE DIMENSION DRAWINGS

prepared	Smevis	11.06.03	SCALE: (A1)	1 : 125	C-C	C	05	2622
checked	Zanki	11.06.03						
approved	Dr.Kahl	11.06.03						



LEGEND

NL-B-601 Coding No. of Concrete Blocks

INSTRUCTION

Nominal Class of Concrete: B 25

Finishes for Unformed Surfaces

- U-CJ Finish
- U1 Finish
- U2 Finish
- U3 Finish

Finishes for Formed Surfaces

- F-CJ Finish
- F1 Finish
- F2 Finish
- F3 Finish

EMBEDDED PARTS

- 101 metal sheet waterstop 400mm/3mm, St 37
- 102 elastomer waterstop (DIN7865) "GUMBA FS 300R" or equivalent
- elastomer waterstop (DIN7865) "GUMBA FWS 500R-MSU" or equivalent (with closed cell foam rubber)
- 171 pore pressure cells, cable conduit
- 201 No. of Embedded Part, to be supplied by Lot2 Contractor and to be installed by LOT1 Contractor

COMPLEMENTARY DRAWINGS

C-C C 05 2629	NAVIGATION LOCKS, AXIS S-T, PLAN El. 51.60
C-C C 05 2756	NAVIGATION LOCKS, SECTION M-M, N-N
C-C S 05 1902/1	CULVERT GATE & STOPLOGS, EMBEDDED PARTS 1st STAGE CONCRETE
C-C S 05 1904/1	CULVERT GATE & STOPLOGS, EMBEDDED PARTS 2nd STAGE CONCRETE
C-C S 00 1805	WATERSTOP DETAILS, EMB. PART Nos. 101 TO 105

APPROVED FOR CONSTRUCTION

REF. MWRI LETTER NO. 441/202 DATE: 28.02.2004

B	approved by MWRI modified as indicated	No. Za.	ZANKE	07.03.04
A	FIRST ISSUE	No. Za.	ZANKE	30.11.03

NEW NAGA HAMMADI BARRAGE AND HYDROPOWER PLANT
PROJECT IMPLEMENTATION UNIT
MWRI - MEE

TASK B - CONSTRUCTION DESIGN

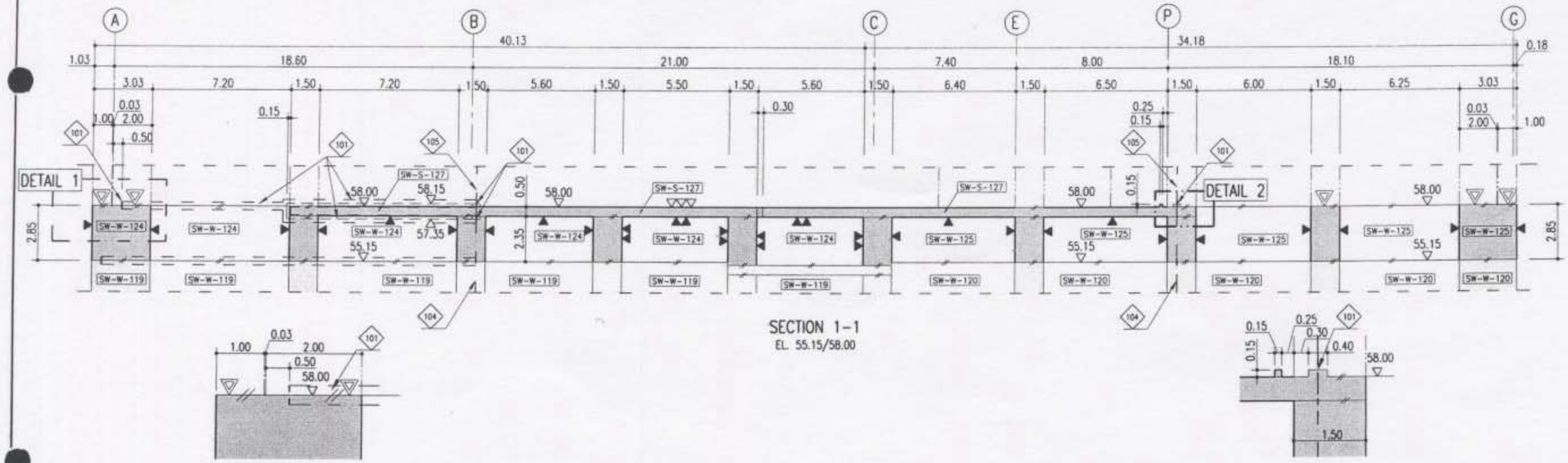
Naga Hammadi Barrage Development Consultants

ELECTROWATT-EKONO Joakim Piaty Group SOGREAH

EMPLOYER'S DRWG. NO.

NAVIGATION LOCK
AXIS V TO AXIS W
PLAN AT El. 51.60

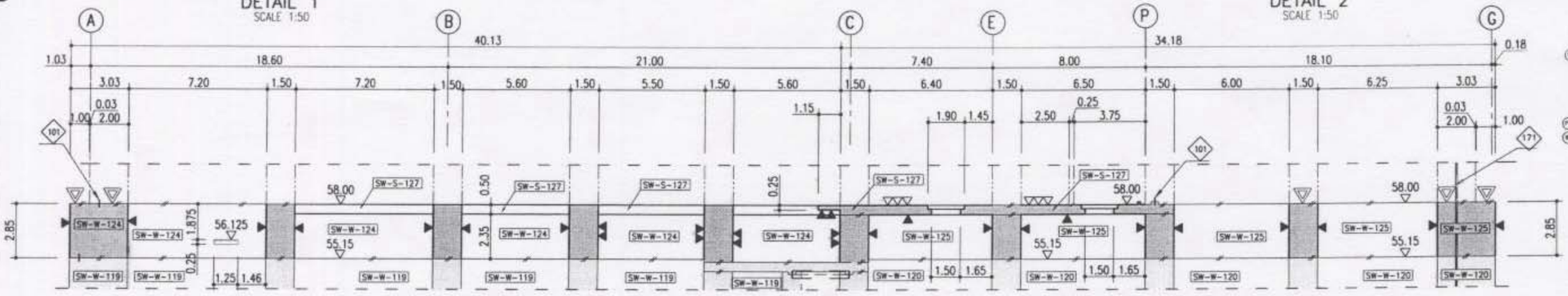
C-C C 05 2631 B



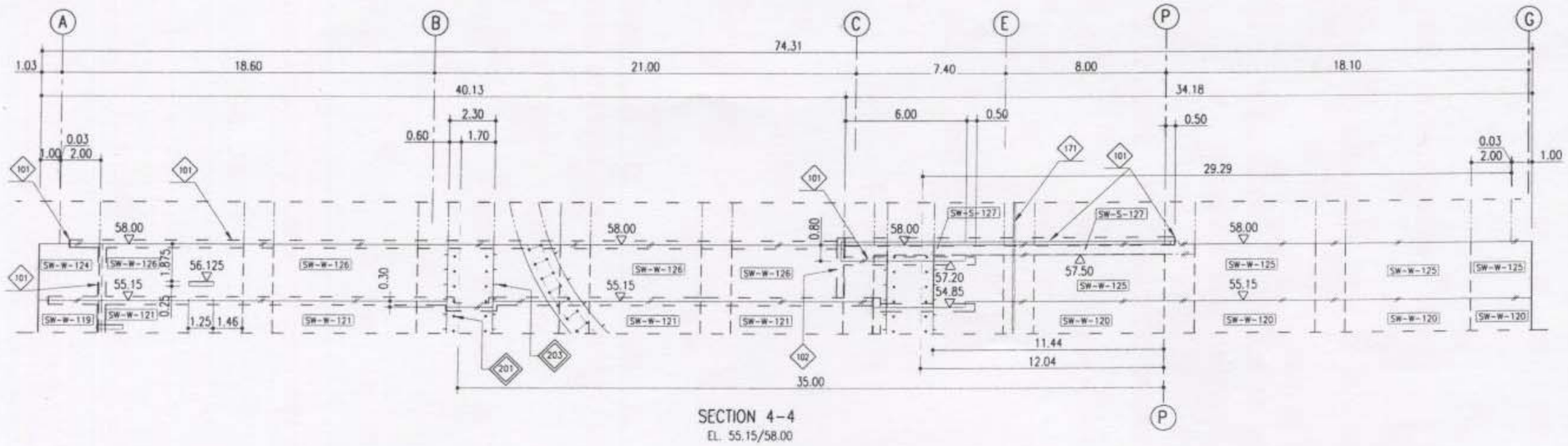
SECTION 1-1
EL. 55.15/58.00

DETAIL 1
SCALE 1:50

DETAIL 2
SCALE 1:50



SECTION 2-2
EL. 55.15/58.00



SECTION 4-4
EL. 55.15/58.00

LEGEND

SW-B-101 Coding No. of Concrete Blocks

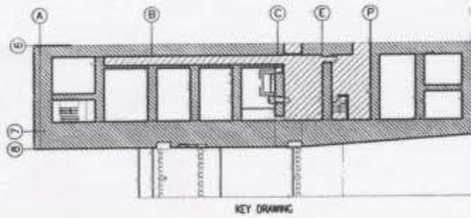
INSTRUCTION
Nominal Class of Concrete: B 25

Finishes for Unformed Surfaces
- U-CJ Finish
- U1 Finish
- U2 Finish
- U3 Finish

Finishes for Formed Surfaces
- F-CJ Finish
- F1 Finish
- F2 Finish
- F3 Finish

EMBEDDED PARTS
- 101 Metal sheet waterstop 400mm/3mm, St 37
- 102 Elastomer waterstop (DIN7865) "GUMBA FS 300R" or equivalent
- 104 elastomer waterstop (DIN7865) "GUMBA FMS 500R-MSU" or equivalent (with closed cell foam rubber)
- 105 elastomer waterstop (DIN7865) "GUMBA FMS 500R" or equivalent
- 171 Pore pressure cells, cable conduits
- 201 STEEL PLATE, TYPE A
- 202 STEEL PLATE, TYPE B
- 203 STEEL PLATE, TYPE C

COMPLEMENTARY DRAWINGS
C-C C 04 2413 SLUICEWAY, INTERMEDIATE PIER, AXES A-G/6-8, PLANS, EL.58.00
C-C C 04 2415 SLUICEWAY, INTERMEDIATE PIER, AXES A-G/6-8, EL. 55.15 TO 58.00, SECTION



approval stamp:

APPROVED FOR CONSTRUCTION

REF. MWRI LETTER NO.: 193/202 DATE: 24.01.04

rev.	description	drawn	checked	date
A	Approved by MWRI	Mrsic	Zanke	18.02.04

NEW NAGA HAMMADI BARRAGE AND HYDROPOWER PLANT
PROJECT IMPLEMENTATION UNIT
MWRI - MEE

TASK B - CONSTRUCTION DESIGN

Naga Hammadi Barrage Development Consultants

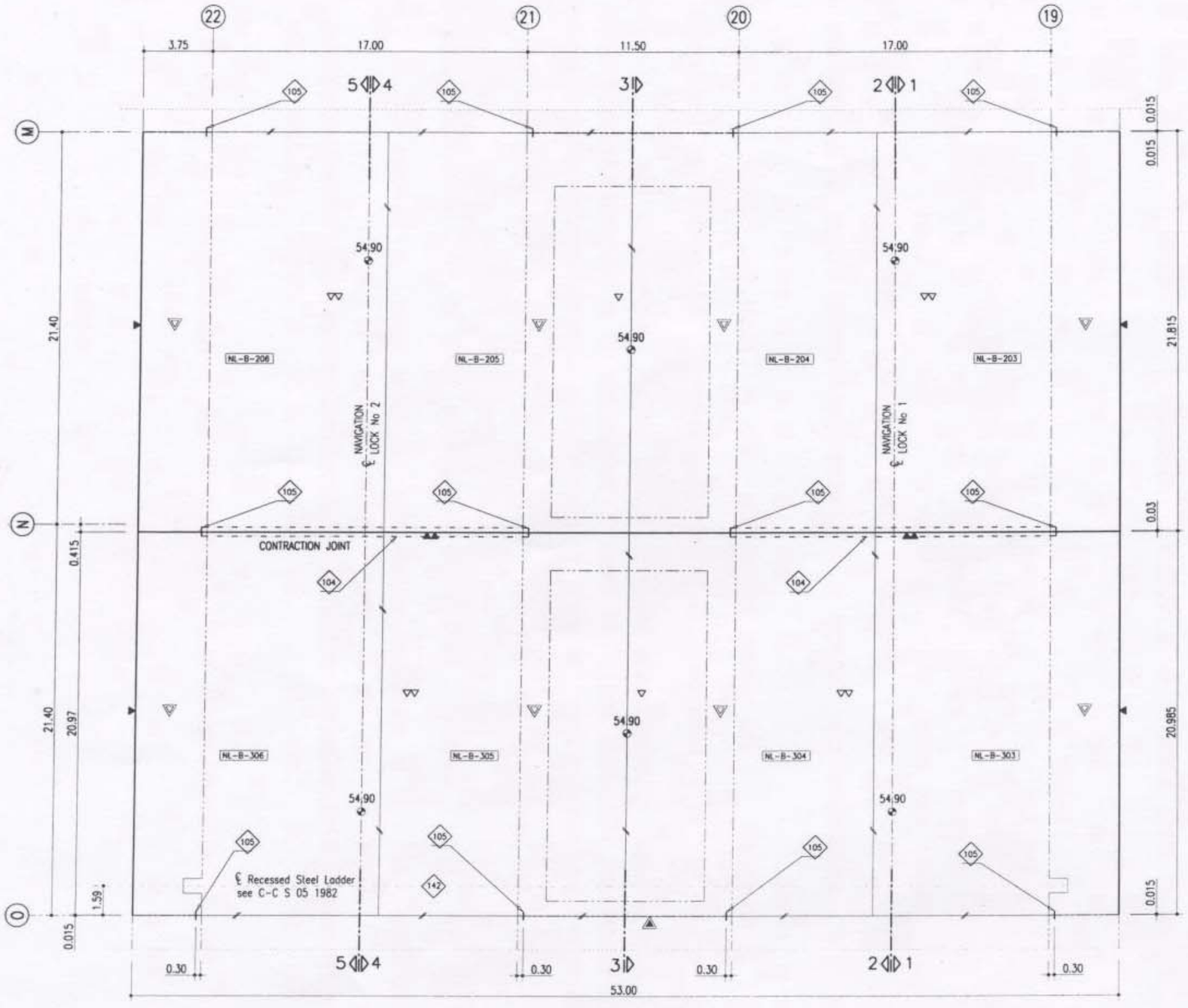
LAHMEYER INTERNATIONAL ELECTROWATT-EKONO Zaklko Pöyry Group SOGREAH

EMPLOYERS DRWG. NO.:

SLUICEWAY
INTERMEDIATE PIER
AXES A-G/6-8, EL. 55.15 TO 58.00
SECTIONS

CONCRETE DIMENSION DRAWING

prepared	Mrsic	04.03.03	SCALE: (A1)	DRWG. NO.		REV.
checked	Zanke	04.03.03	1 : 125	C-C	C 04 2414	A
approved	Dr Kothi	04.03.03				



LEGEND

NL-B-203 Coding No. of Concrete Blocks

INSTRUCTION

Nominal Class of Concrete: B 25

Finishes for Unformed Surfaces	Finishes for Formed Surfaces
U-CJ Finish	
U1 Finish	
U2 Finish	
U3 Finish	

EMBEDDED PARTS

104 elastomer waterstop (DIN7865) "DUMBA FWS 500R-MSU" or equivalent (with closed cell foam rubber)

105 elastomer waterstop (DIN7865) "DUMBA FWS 500R-MSU" or equivalent

COMPLEMENTARY DRAWINGS

C-C C 05 2660 NAVIGATION LOCKS, AXIS K-M, PLAN EL 54.90
C-C C 05 2662 NAVIGATION LOCKS, AXIS O-S, PLAN EL 54.90
C-C C 05 2753 NAVIGATION LOCKS, SECTION G-G, H-H

APPROVED FOR CONSTRUCTION

REF. MWRI LETTER NO.: 441/202 DATE: 28.02.2004

rev.	description	drawn	checked	date
B	approved by MWRI	Mo. Za.	ZANKE	07.03.04
A	FIRST ISSUE	Mo. Za.	ZANKE	30.11.03

NEW NAGA HAMMADI BARRAGE AND HYDROPOWER PLANT
PROJECT IMPLEMENTATION UNIT
MWRI - MEE

TASK B - CONSTRUCTION DESIGN

Naga Hammadi Barrage Development Consultants

LAHMEYER INTERNATIONAL · ELECTROWATT-EKONO Joakko Poyry Group · SOGREAH

EMPLOYERS DRWG. NO.:

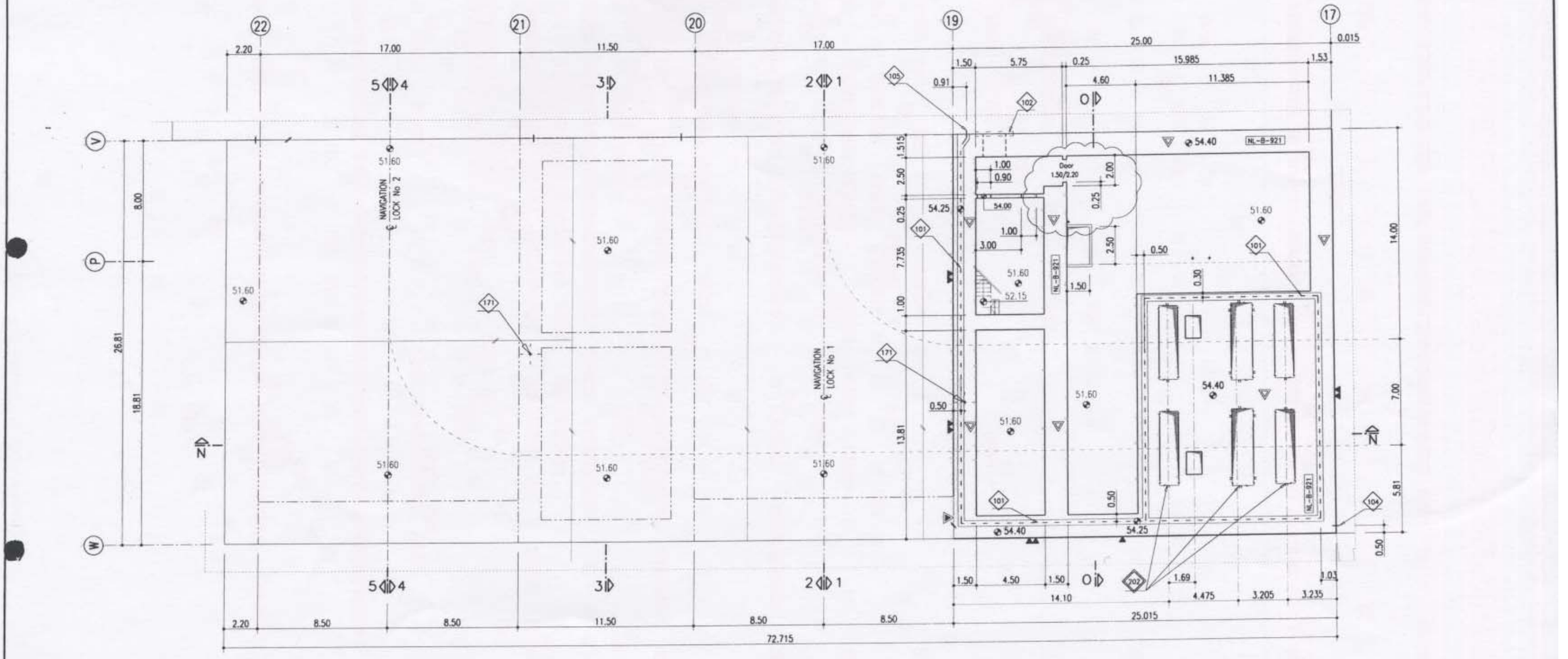
NAVIGATION LOCK

AXIS M TO AXIS O

PLAN AT EL. 54.90

CONSULTANTS DRAWING

prepared	Simone	16.06.03	SCALE: (A1)	1:25	DRWG. NO. C-C C 05 2661	REV. B
checked	Ophee	16.06.03				
approved	Dr.Kalb	16.06.03				



LEGEND

NL-B-921 Coding No. of Concrete Blocks

INSTRUCTION

Nominal Class of Concrete: B 25

Finishes for Unformed Surfaces		Finishes for Formed Surfaces	
U-CJ Finish		F-CJ Finish	
U1 Finish		F1 Finish	
U2 Finish		F2 Finish	
U3 Finish		F3 Finish	

EMBEDDED PARTS

- 101 metal sheet waterstop 400mm/3mm, St 37
- 102 elastomer waterstop (DIN7865) "GUMBA FS 300R" or equivalent
- 105 elastomer waterstop (DIN7865) "GUMBA FMS 500R-MSU" or equivalent
- 171 pore pressure cells, cable conduit
- 201 No. of Embedded Part, to be supplied by Lot2 Contractor and to be installed by LOT1 Contractor

COMPLEMENTARY DRAWINGS

C-C C 05 2663 NAVIGATION LOCKS, AXIS S-T, PLAN El. 54.90
C-C C 05 2756 NAVIGATION LOCKS, SECTION W-M, N-N
C-C S 05 1902/1 CULVERT GATE STOPLOGS, EMBEDDED PARTS 1st STAGE CONCRETE
C-C S 05 1904/1 CULVERT GATE STOPLOGS, EMBEDDED PARTS 2nd STAGE CONCRETE
C-C S 00 1805 WATERSTOP DETAILS, EMB. PART Nos. 101 TO 105

APPROVED FOR CONSTRUCTION

REF. MWRI LETTER NO. 441/202 DATE: 28.02.2004

C	modified as indicated	Wo. Za.	ZANKI	10.03.04
B	approved by MWRI	Wo. Za.	ZANKI	07.03.04
A	FIRST ISSUE	Wo. Za.	ZANKI	30.11.03

NEW NAGA HAMMADI BARRAGE AND HYDROPOWER PLANT
PROJECT IMPLEMENTATION UNIT
MWRI – MEE

TASK B – CONSTRUCTION DESIGN

Naga Hammadi Barrage Development Consultants

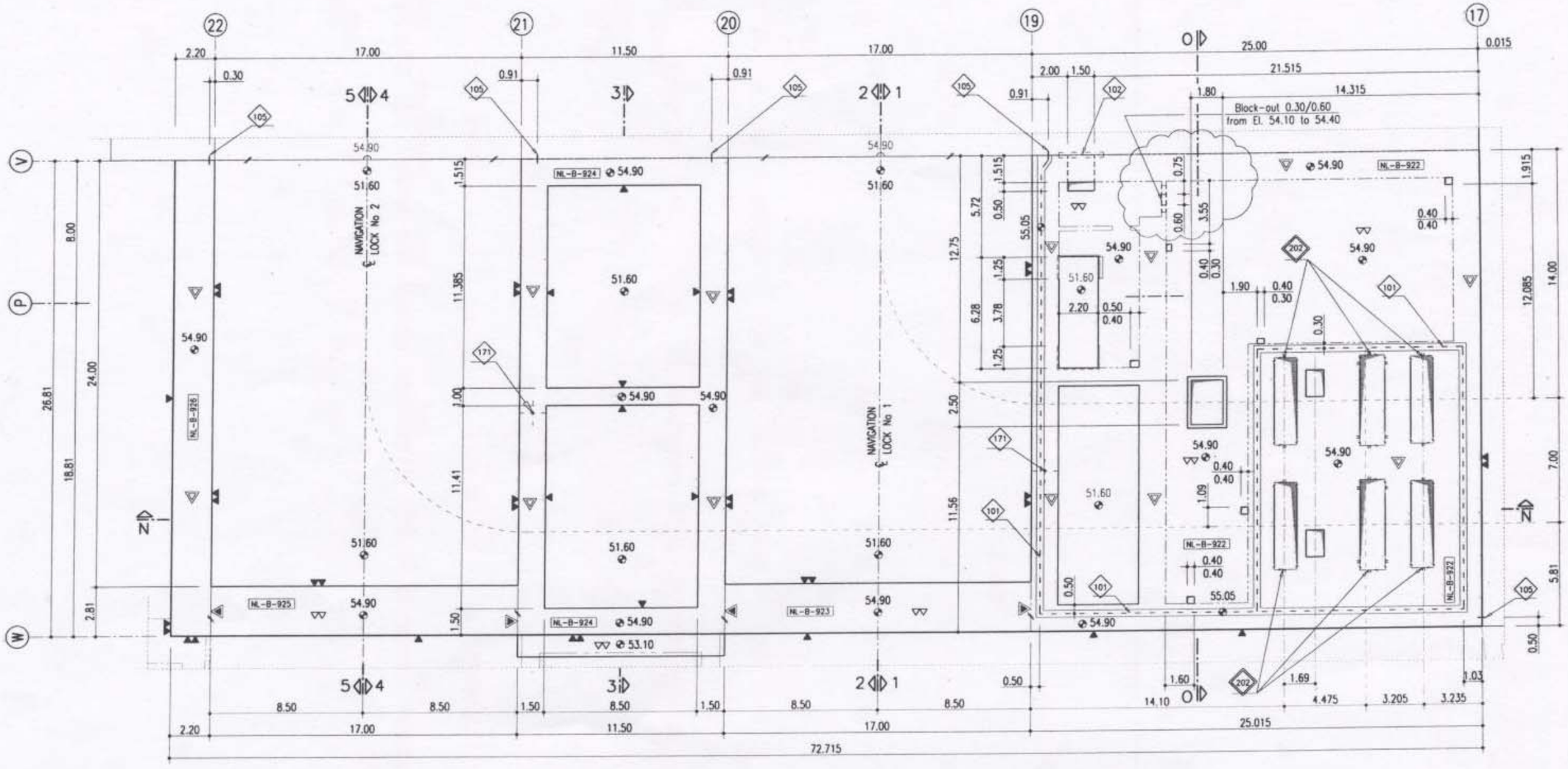
ELECTROWATT-EKONO Zublin Poyry Group SOGREAH

EMPLOYERS DRWG. NO.:

NAVIGATION LOCK
AXIS V TO AXIS W
PLAN AT El. 54.40
SHEET 1 OF 2

CONCRETE DIMENSION DRAWING

prepared: Tarabia 14.08.03 SCALE: 1:1 DRWG. NO.:
checked: Zanki 14.08.03 1:25 C-C C 05 2665/1 C
approved: El Ruby 14.08.03



EGEND

NL-B-922 Coding No. of Concrete Blocks

STRUCTION

ominal Class of Concrete: B 25

Finishes for Unformed Surfaces	Finishes for Formed Surfaces
U-CJ Finish	F-CJ Finish
U1 Finish	F1 Finish
U2 Finish	F2 Finish
U3 Finish	F3 Finish

MBEDDED PARTS

101 metal sheet waterstop 400mm/3mm, St 37

105 elastomer waterstop (DIN7865) "GUMBA FMS 500R-MSU" or equivalent

171 pore pressure cells, cable conduit

201 No. of Embedded Part, to be supplied by Lot2 Contractor and to be installed by Lot1 Contractor

COMPLEMENTARY DRAWINGS

C-C C 05 2663 NAVIGATION LOCKS, AXIS S-T, PLAN El. 54.90
C-C C 05 2756 NAVIGATION LOCKS, SECTION M-M, N-N
C-C S 05 1902/1 CULVERT GATE STOPLOGS, EMBEDDED PARTS 1st STAGE CONCRETE
C-C S 05 1904/1 CULVERT GATE STOPLOGS, EMBEDDED PARTS 2nd STAGE CONCRETE
C-C S 00 1805 WATERSTOP DETAILS, EMB. PART Nos. 101 TO 105

APPROVED FOR CONSTRUCTION

REF. MWRI LETTER NO. 441/202 DATE 26.02.2004

C	modified as indicated	No. Za.	ZANKE	10.03.04
B	approved by MWRI	No. Za.	ZANKE	07.03.04
A	FIRST ISSUE	No. Za.	ZANKE	30.11.03

NEW NAGA HAMMADI BARRAGE AND HYDROPOWER PLANT
PROJECT IMPLEMENTATION UNIT
MWRI – MEE

TASK B – CONSTRUCTION DESIGN

Naga Hammadi Barrage Development Consultants

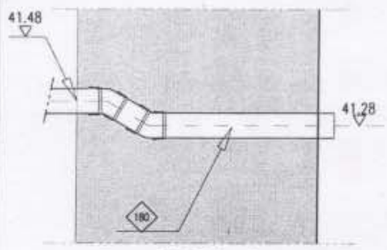
ACE LAHMEYER INTERNATIONAL ELECTROWATT-EKONO Jaakko Pöyry Group SOGREAH

EMPLOYERS DRWG. NO.

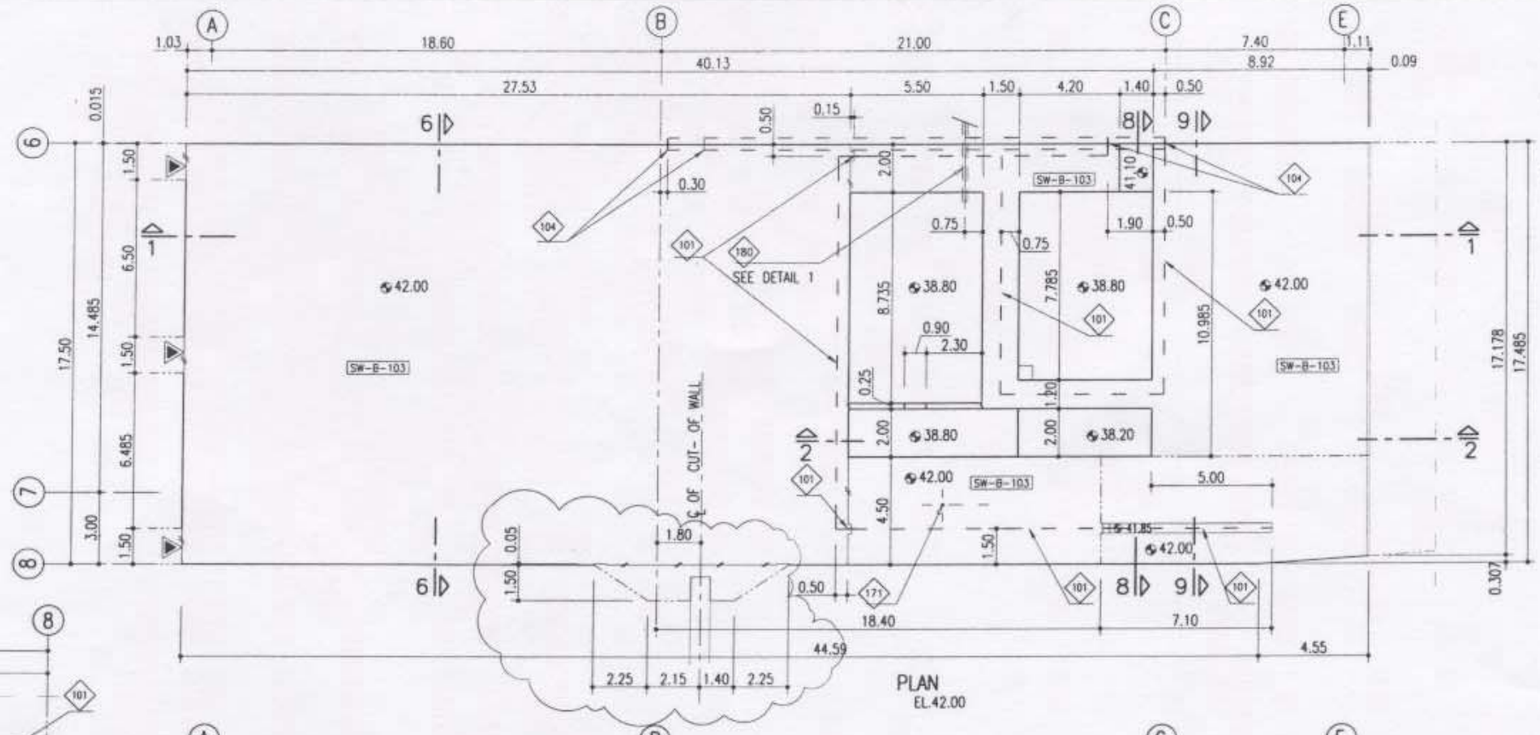
NAVIGATION LOCK
AXIS V TO AXIS W
PLAN AT El. 54.90
SHEET 2 OF 2

CONCRETE DIMENSION DRAWING

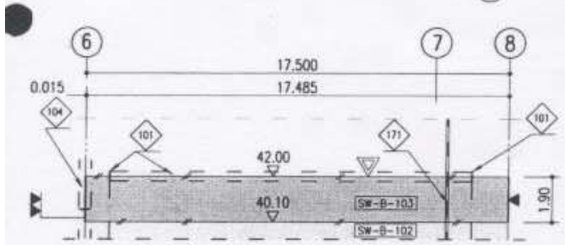
prepared	Smaltz	14.08.03	SCALE 1:100	DRWG. NO.	C-C C 05 2665/2	REV.	C
checked	Zahn	14.08.03					
approved	Dr.Kalla	14.08.03					



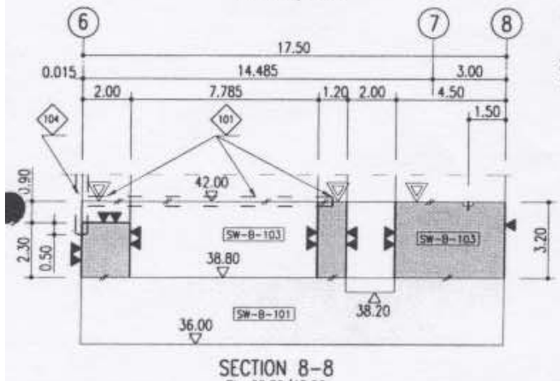
DETAIL 1
SCALE 1:25



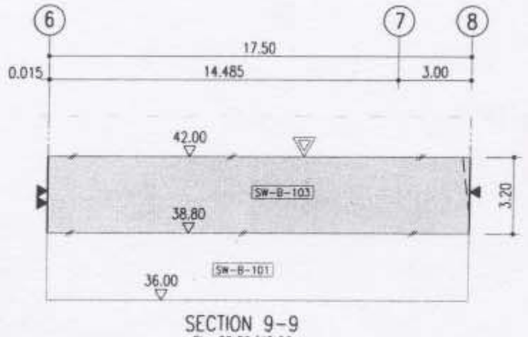
PLAN
EL.42.00



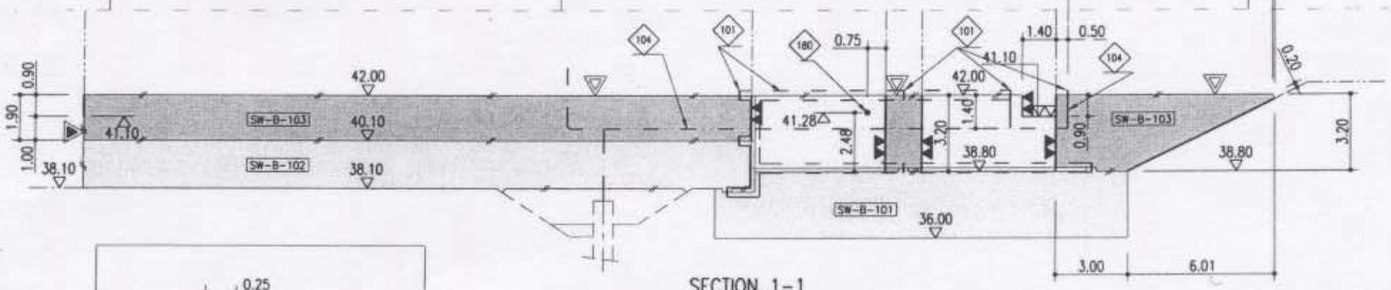
SECTION 6-6
EL. 40.10/42.00



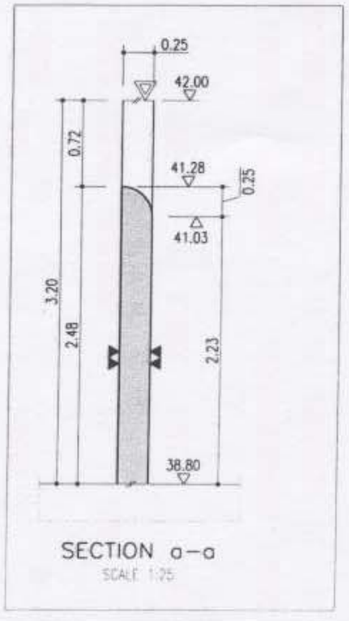
SECTION 8-8
EL. 38.80/42.00



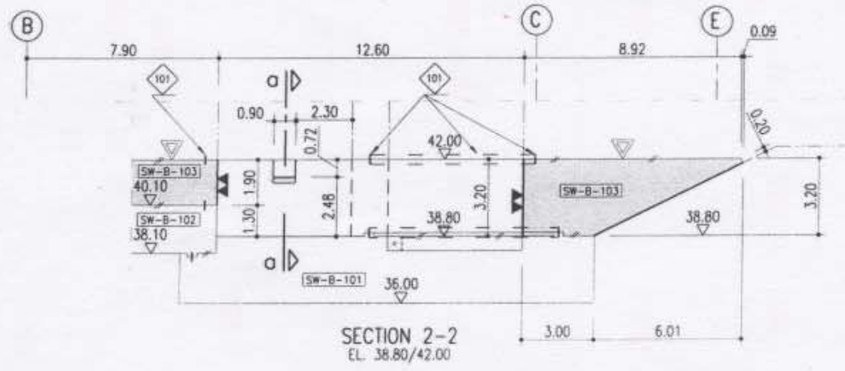
SECTION 9-9
EL. 38.80/42.00



SECTION 1-1
EL. 38.80/42.00



SECTION a-a
SCALE 1:25



SECTION 2-2
EL. 38.80/42.00

LEGEND

SW-B-103 Coding No. of Concrete Blocks

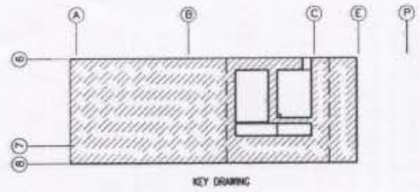
INSTRUCTION
Nominal Class of Concrete: B 25

Finishes for Unformed Surfaces
- U-CJ Finish
- U1 Finish
- U2 Finish
- U3 Finish

Finishes for Formed Surfaces
- F-CJ Finish
- F1 Finish
- F2 Finish
- F3 Finish

EMBEDDED PARTS
- 101 Metal sheet waterstop 400mm/3mm, St 37
- 104 elastomer waterstop (DIN7865) "GUMBA FWS 500R-W5U" or equivalent (with closed cell foam rubber)
- 171 Pore pressure cells, cable conduits
- 180 Drainage , Cast Iron Pipe DN200

REFERENCE DRAWINGS
- C-C P 03 1301 POWERHOUSE, AXES 1-8/A-G, PLAN, EL.41.10
- C-C P 03 1302 POWERHOUSE, AXES 6-8/B-E, PLANS, EL. 41.10 & 43.20
- C-C C 00 2001 GENERAL NOTES
- C-C C 03 2400 SLUICEWAY, INTERMEDIATE PIER, AXES B-C/6-8, EL.36.00 TO 38.80 PLAN EL.38.80 AND SECTIONS
- C-C C 03 2401 SLUICEWAY, INTERMEDIATE PIER, AXES B-C/6-8, EL.36.00 TO 40.10 PLAN EL.40.10 AND SECTIONS



KEY DRAWING

approval stamp:

APPROVED FOR CONSTRUCTION

REF. MWRI LETTER NO.: 193/202 DATE: 24.01.04

rev.	description	drawn	checked	date
A	Approved by MWRI	Mrsic	Zonke	18.02.04
	As indicated			

NEW NAGA HAMMADI BARRAGE AND HYDROPOWER PLANT
PROJECT IMPLEMENTATION UNIT
MWRI - MEE

TASK 8 - CONSTRUCTION DESIGN

Naga Hammadi Barrage Development Consultants

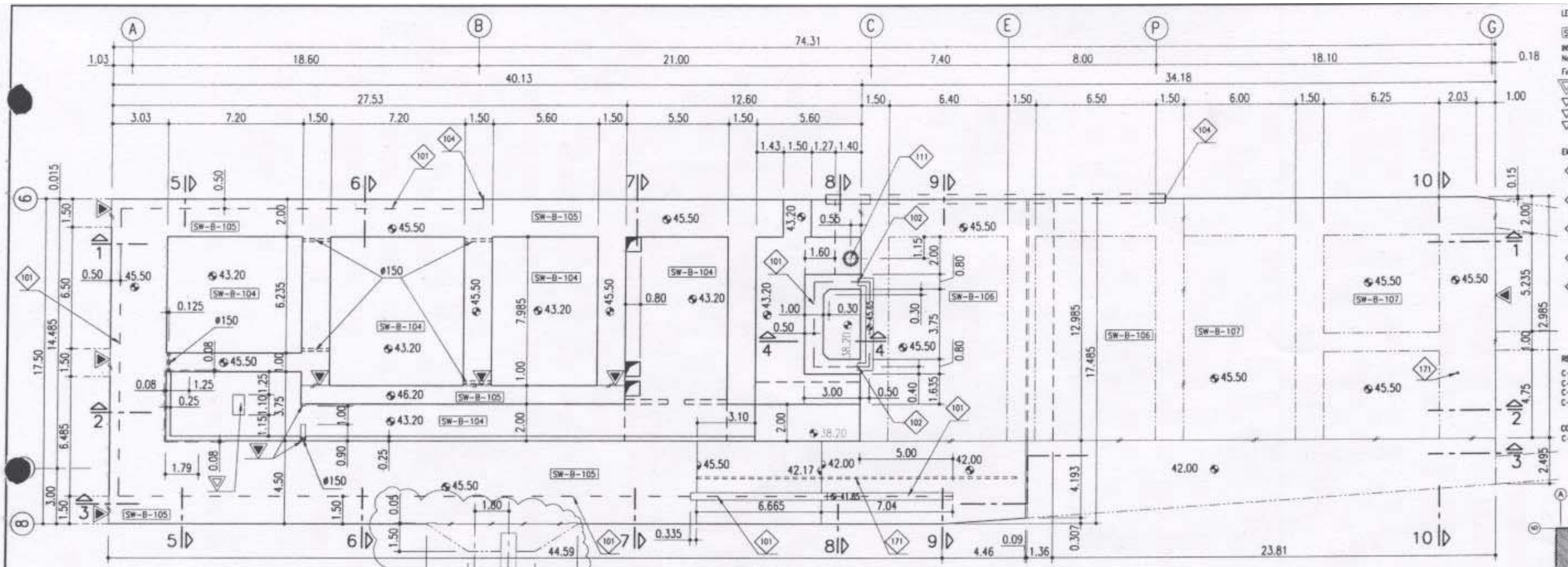
LAHMEYER INTERNATIONAL · ELECTROWATT-EKONO Joakko Pöyry Group · SOGREAH

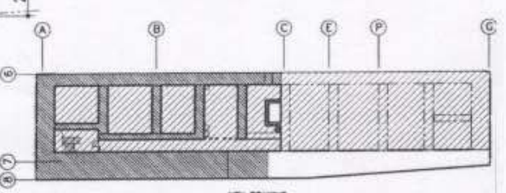
EMPLOYERS DRWG. NO.:

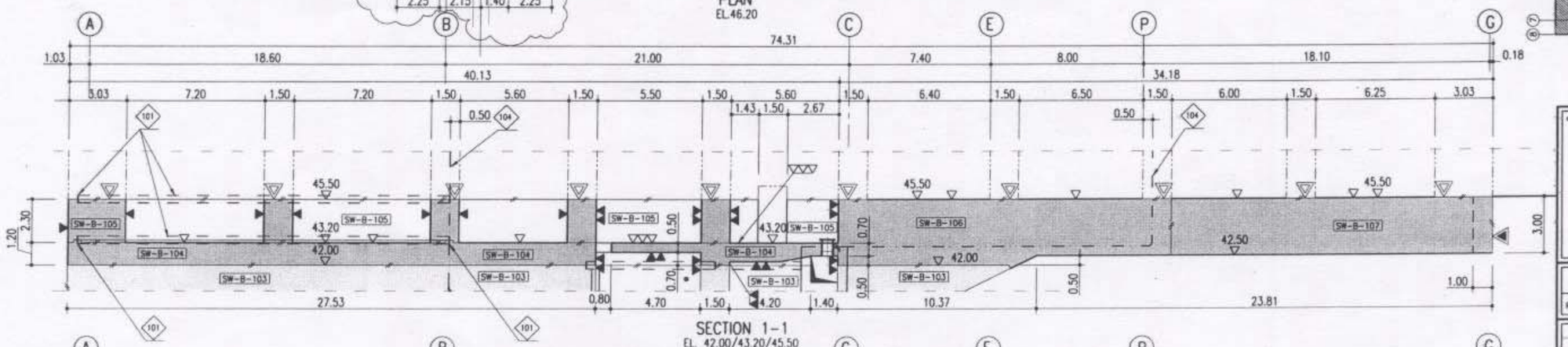
SLUICEWAY
INTERMEDIATE PIER
AXES A-E/6-8, EL. 38.20 TO 42.00
PLAN,EL.42.00 AND SECTIONS

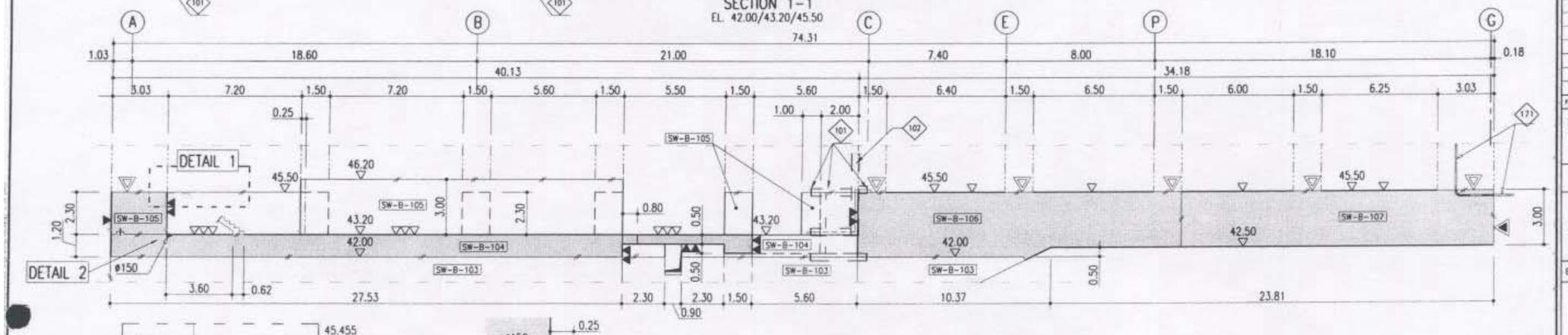
CONCRETE DIMENSION DRAWING

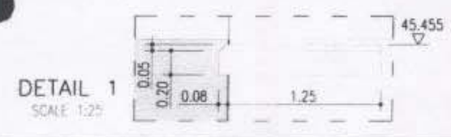
prepared: Mrsic	08.03.03	SCALE: (A1) 1 : 125	DRWG. NO: C-C C 04 2402	REV. A
checked: Zonke	08.03.03			
approved: Dr Kishk	08.03.03			

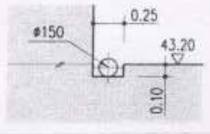












LEGEND

SW-B-107 Coding No. of Concrete Blocks

INSTRUCTION

Nominal Class of Concrete: B 25

Finishes for Unformed Surfaces

- U-CJ Finish
- U1 Finish
- U2 Finish
- U3 Finish

Finishes for Formed Surfaces

- F-CJ Finish
- F1 Finish
- F2 Finish
- F3 Finish

EMBEDDED PARTS

- 101 Metal sheet waterstop 400mm/3mm, St 37
- 102 Elastomer waterstop (DIN7865) "GUMBA FS 300R" or equivalent
- 104 elastomer waterstop (DIN7865) "GUMBA FMS 500R-WSU" or equivalent (with closed cell foam rubber)
- 111 Manhole at pressurized dewatering pump pit.
- 171 Pore pressure cells, cable conduits

REFERENCE DRAWINGS

C-C P 03 1304 POWERHOUSE, AXES 1-8/A-G, PLAN, EL.43.20
C-C P 03 1307 POWERHOUSE, AXES 1-8/A-G, PLAN, EL. 46.60
C-C C 00 2001 GENERAL NOTES
C-C C 03 2402 SLUICEWAY, INTERMEDIATE PIER, AXES A-E/6-8, EL.38.20 TO 42.00 PLAN, EL.42.00 AND SECTIONS

COMPLEMENTARY DRAWINGS

C-C C 03 2404 SLUICEWAY, INTERMEDIATE PIER, AXES A-G/6-8, EL.42.00 TO 45.50 SECTIONS & DETAILS

approval stamp:

APPROVED FOR CONSTRUCTION

REF. MWRI LETTER NO.: 193/202 DATE: 24.01.04

rev.	description	drawn	checked	date
A	Approved by MWRI	Mrsic	Zanke	18.02.04
	As indicated			

NEW NAGA HAMMADI BARRAGE AND HYDROPOWER PLANT
PROJECT IMPLEMENTATION UNIT
MWRI - MEE

TASK 8 - CONSTRUCTION DESIGN

Naga Hammadi Barrage Development Consultants

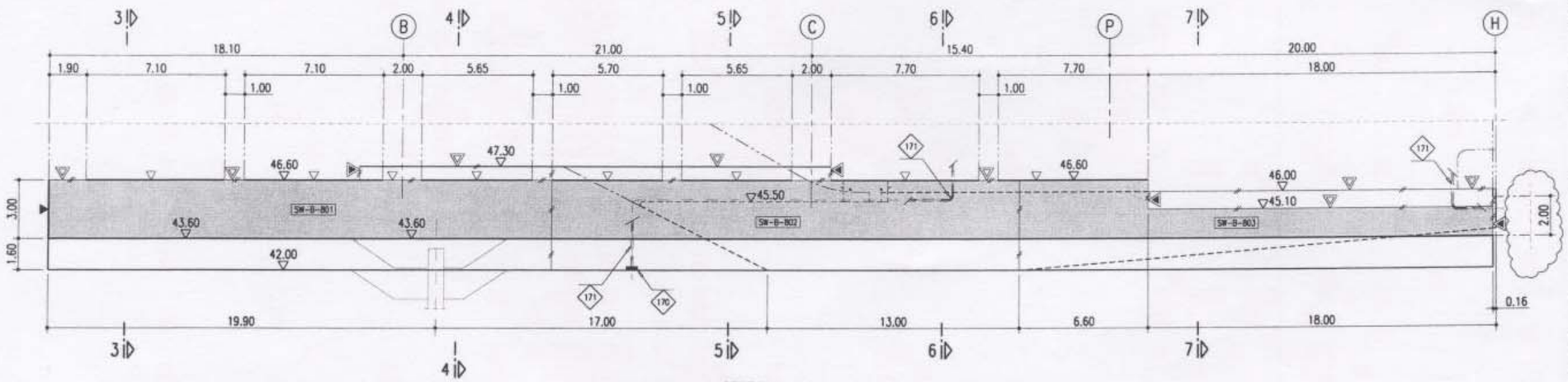
LAHMEYER INTERNATIONAL ELECTROWATT-EKONO Joakko Poyry Group SOGREAH

EMPLOYERS DRWG. NO.:

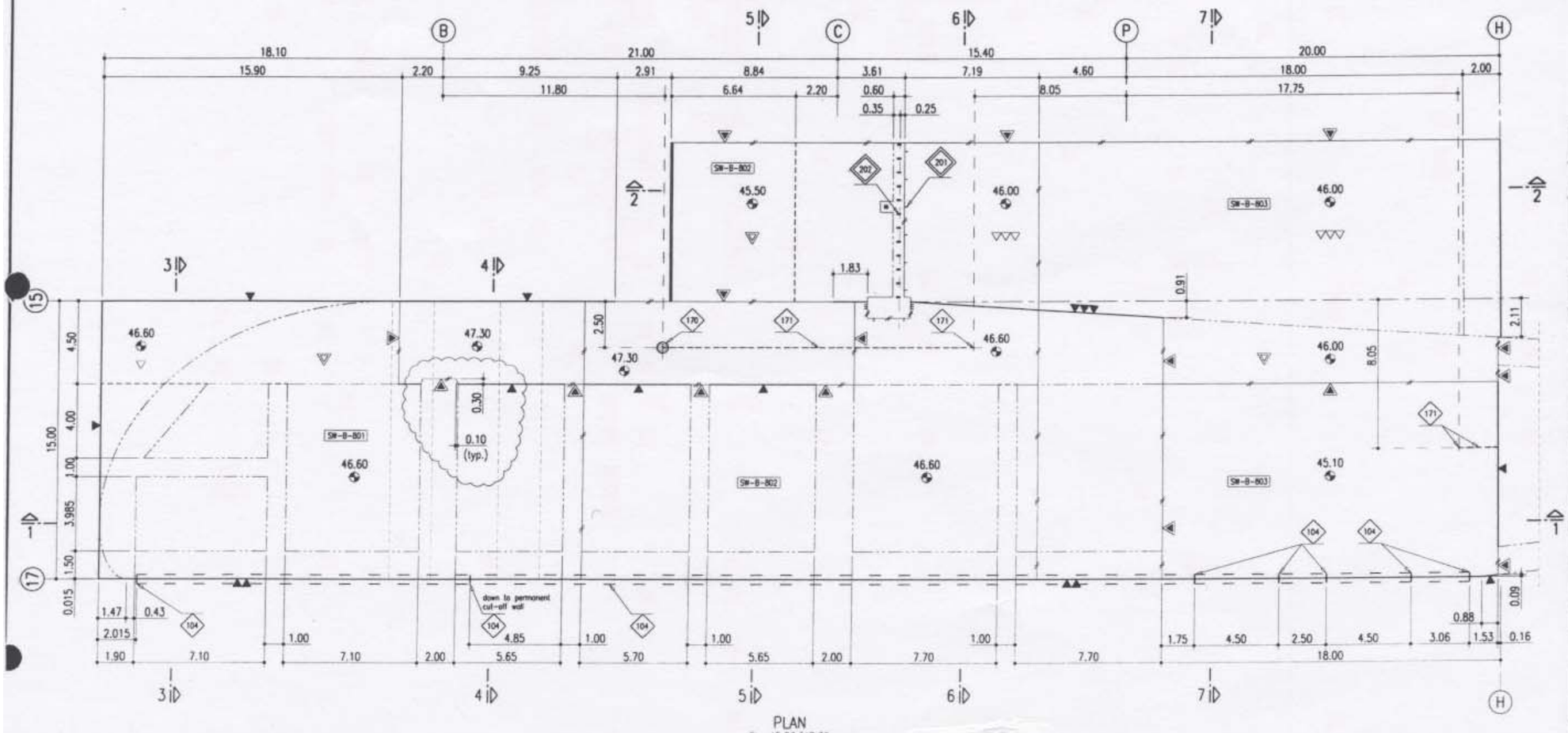
SLUICEWAY
INTERMEDIATE PIER
AXES A-G/6-8, EL. 42.00 TO 45.50
PLAN, EL.46.20 AND SECTIONS

CONCRETE DIMENSION DRAWING

prepared:	Mrsic		12.03.03	SCALE (A1)	DRWG. NO.			REV.
checked:	Zanke		12.03.03	1 : 125	C-C	C	04	2403	A
approved:	Dr.Kohl		12.03.03					



SECTION 1-1
EL. 42.00/47.30



PLAN
EL. 45.50/47.30

LEGEND

SW-B-801 Coding No. of Concrete Blocks

INSTRUCTION

Nominal Class of Concrete: B 25

Finishes for Unformed Surfaces

- U-CJ Finish
- U1 Finish
- U2 Finish
- U3 Finish

Finishes for Formed Surfaces

- F-CJ Finish
- F1 Finish
- F2 Finish
- F3 Finish

EMBEDDED PARTS

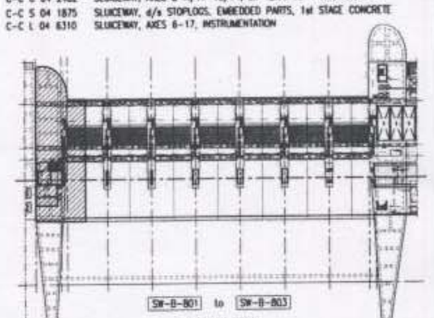
- 104 — elastomer waterstop (DIN7865) "CLIMBA FWS 500R-WSU" or equivalent (with closed cell foam rubber)
- 170 — pore pressure cells acc. to P.T.S. – Section 6
- 171 — pore pressure cells, cable conduit
- 2X3 — No. of Embedded Part, to be supplied by Lot2 Contractor and to be installed by LOT1 Contractor

REFERENCE DRAWINGS

C-C P 04 1402 SLUICEWAY, PLAN AT El. 52.80
C-C P 04 1440 SLUICEWAY, ABUTMENT PIER-u/s PART, PLAN AT El. 46.00/53.25
C-C C 00 2001 GENERAL NOTES

COMPLEMENTARY DRAWINGS

C-C C 04 2480 SLUICEWAY, FOUNDATION SLAB AND ABUTMENT PIER, GEOMETRY
C-C C 04 2482 SLUICEWAY, AXES B-H/17-15/14, El. 42.00 TO 47.30, SECTIONS
C-C S 04 1875 SLUICEWAY, d/s STOPLOGS, EMBEDDED PARTS, 1st STAGE CONCRETE
C-C L 04 8310 SLUICEWAY, AXES 8-17, INSTRUMENTATION



approval stamp:

APPROVED FOR CONSTRUCTION

REF. MWRI LETTER NO.: 2982/202 DATE: 29.10.03

rev.	description	drawn	checked	date
B	modified as indicated	Selim	Zanke	17.01.04
A	Approved by MWRI	Selim	Zanke	30.11.03

NEW NAGA HAMMADI BARRAGE AND HYDROPOWER PLANT
PROJECT IMPLEMENTATION UNIT
MWRI – MEE

TASK B – CONSTRUCTION DESIGN

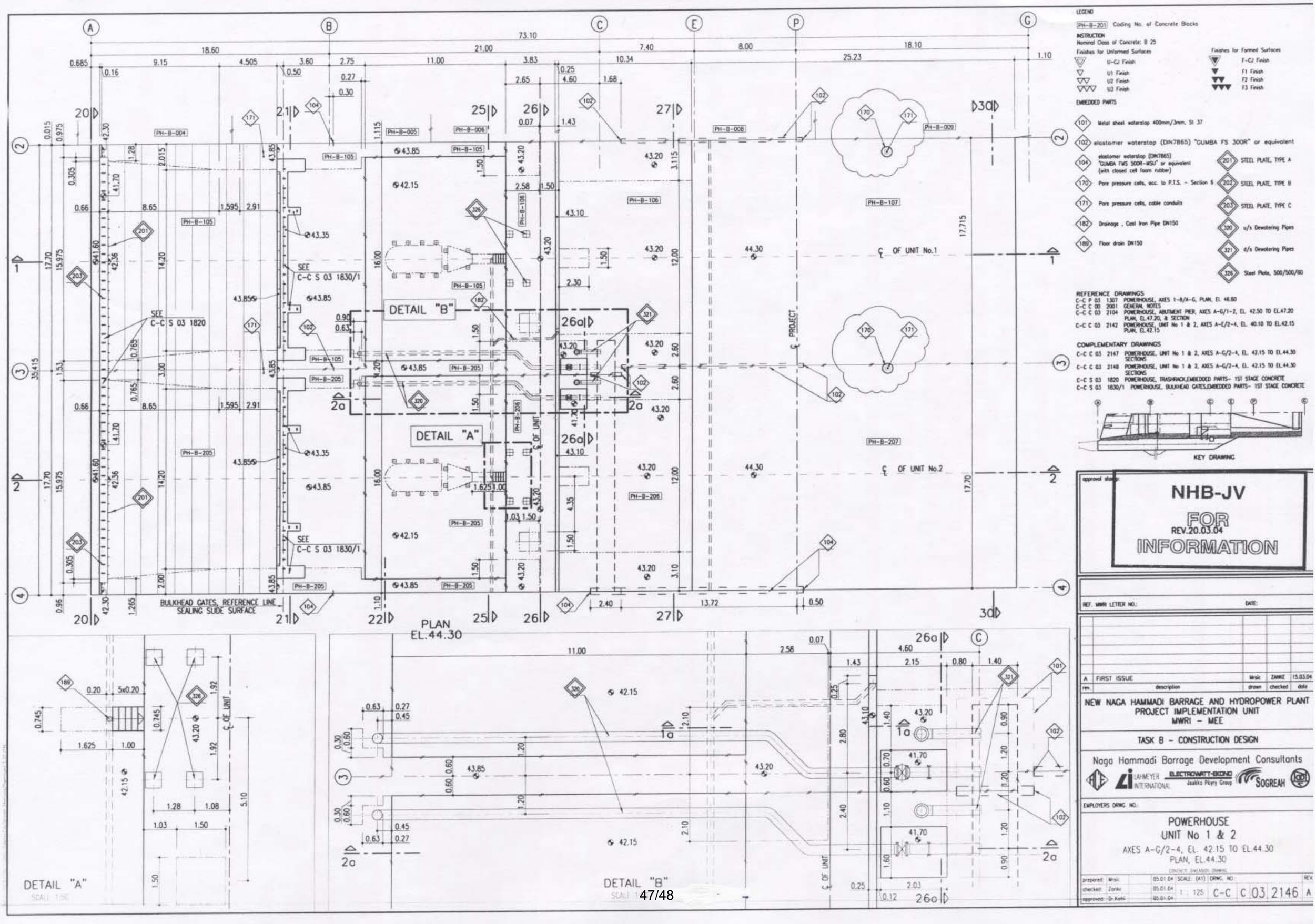
Naga Hammadi Barrage Development Consultants

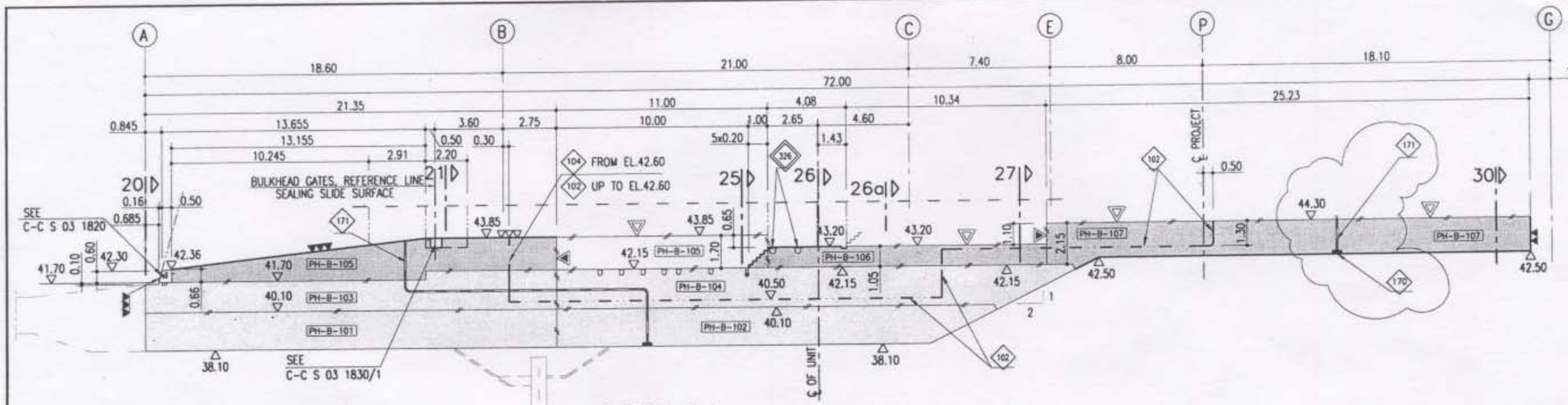
LAHMEYER INTERNATIONAL · ELECTROWATT-EKONO Joakko Pöyry Group · SOGREAH

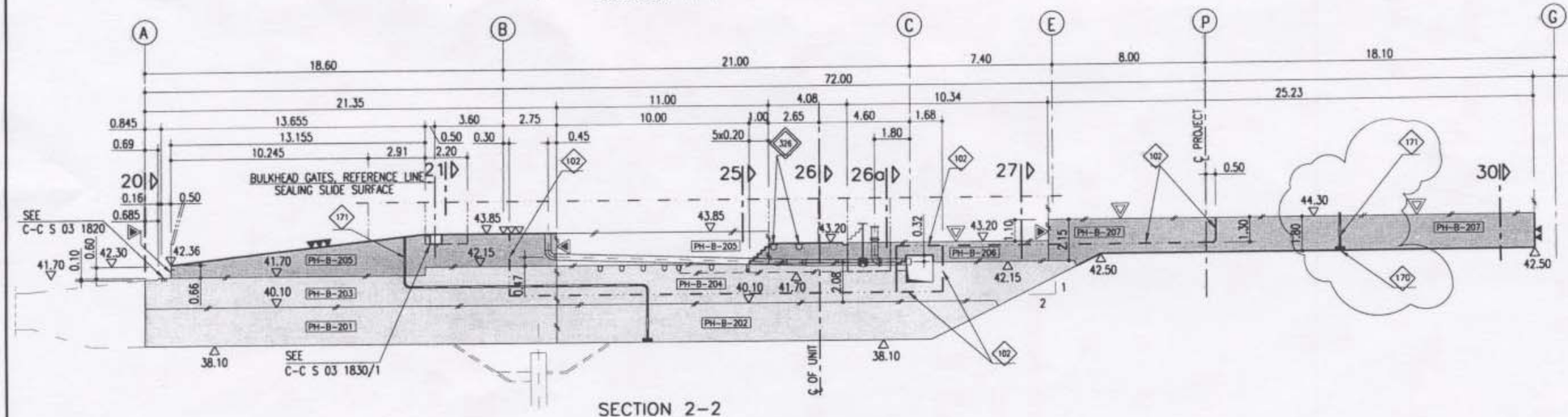
EMPLOYERS DRWG. NO.:

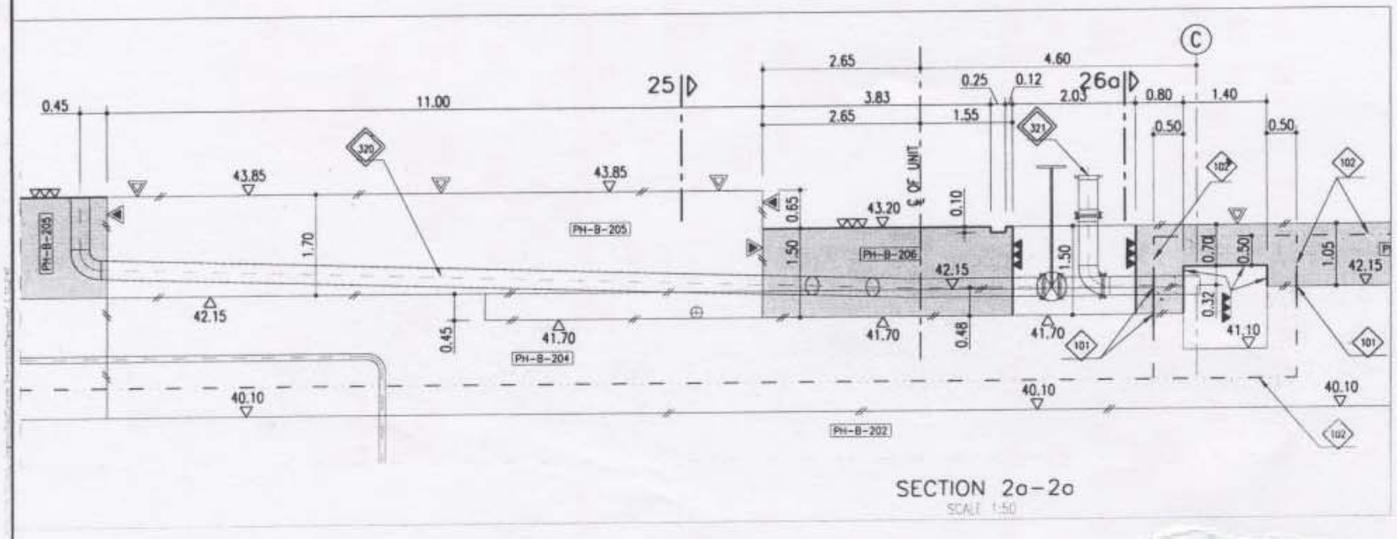
SLUICEWAY
AXES B-H/17-15/14, EL. 42.00 TO 47.30
PLAN AND SECTION

prepared: Saleh		10.04.03	SCALE: (A1)	DRWG. NO.:		REV.
checked: Zanke		10.04.03	1 : 125	C-C	C 04 2481	B
approved: Dr.Kahl		10.04.03				

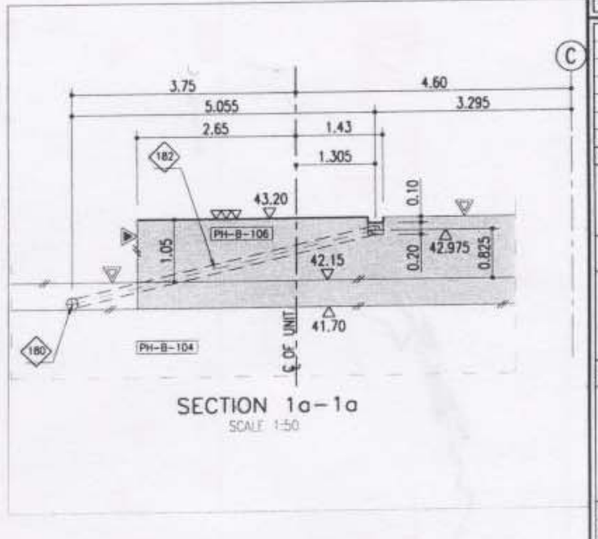

DETAIL "B"
DETAIL "A"
SEE C-C S 03 1830/1
SEE C-C S 03 1820
BULKHEAD GATES, REFERENCE LINE SEALING SLIDE SURFACE
PLAN EL.44.30
DETAIL "A"
DETAIL "B"
℄ OF UNIT No.1
℄ OF UNIT No.2
℄ PROJECT
LEGEND
INSTRUCTION
Nominal Class of Concrete: B 25
Finishes for Unformed Surfaces
Finishes for Formed Surfaces
EMBEDDED PARTS
REFERENCE DRAWINGS
COMPLEMENTARY DRAWINGS
KEY DRAWING
NHB-JV
FOR INFORMATION
REV.20.03.04
NEW NAGA HAMMADI BARRAGE AND HYDROPOWER PLANT
PROJECT IMPLEMENTATION UNIT
MWRI – MEE
TASK B – CONSTRUCTION DESIGN
Naga Hammadi Barrage Development Consultants
POWERHOUSE
UNIT No 1 & 2
AXES A-G/2-4, EL. 42.15 TO EL.44.30
PLAN, EL.44.30
C-C C 03 2146







SECTION 2a-2a
SCALE 1:50



SECTION 1a-1a
SCALE 1:50

LEGEND

PH-B-201 Coding No. of Concrete Blocks

INSTRUCTION
Nominal Class of Concrete: B 25

Finishes for Unformed Surfaces
- U-CJ Finish
- U1 Finish
- U2 Finish
- U3 Finish

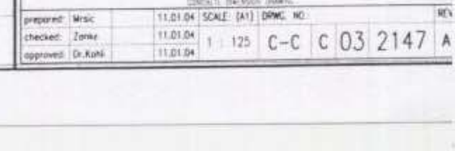
Finishes for Formed Surfaces
- F-CJ Finish
- F1 Finish
- F2 Finish
- F3 Finish

EMBEDDED PARTS

- 101 Metal sheet waterstop 400mm/3mm, St 37
- 102 elastomer waterstop (DIN7865) "GUMBA FS 300R" or equivalent
- 104 elastomer waterstop (DIN7865) "GUMBA FWS 500R-WSU" or equivalent (with closed cell foam rubber)
- 170 Pore pressure cells, acc. to P.T.S. - Section 8
- 171 Pore pressure cells, cable conduits
- 182 Drainage , Cast Iron Pipe DN150
- 201 STEEL PLATE, TYPE A
- 202 STEEL PLATE, TYPE B
- 203 STEEL PLATE, TYPE C
- 320 u/s Dewatering Pipes
- 321 d/s Dewatering Pipes
- 326 Steel Plate, 500/500/60

COMPLEMENTARY DRAWINGS

C-C C 03 2146 POWERHOUSE, UNIT No 1 & 2, AXES A-G/2-4, EL. 42.15 TO EL.44.30 PLAN, EL.44.85
C-C C 03 2148 POWERHOUSE, UNIT No 1 & 2, AXES A-G/2-4, EL. 42.15 TO EL.44.30 SECTIONS
C-C S 03 1820 POWERHOUSE, TRASHRACK,EMBEDDED PARTS- 1ST STAGE CONCRETE
C-C S 03 1830/1 POWERHOUSE, BULKHEAD GATES,EMBEDDED PARTS- 1ST STAGE CONCRETE



KEY DRAWING

approval stamp:

NHB-JV

FOR INFORMATION

REV.2 05.04

REF. MWR LETTER NO.: DATE:

rev.	description	drawn	checked	date
A	FIRST ISSUE	Mrsic	ZANKE	15.03.04

NEW NAGA HAMMADI BARRAGE AND HYDROPOWER PLANT
PROJECT IMPLEMENTATION UNIT
MWRI - MEE

TASK B - CONSTRUCTION DESIGN

Naga Hammadi Barrage Development Consultants

LAHMEYER INTERNATIONAL · ELECTROWATT-EKONO Jaakko Pöyry Group · SOGREAH

EMPLOYERS DRWG. NO.:

POWERHOUSE
UNIT No 1 & 2
AXES A-G/2-4, EL. 42.15 TO EL.44.30
SECTIONS

CONCRETE DIMENSION DRAWING

prepared: Mrsic	11.01.04	SCALE: (A1)	DRWG. NO:		REV.
checked: Zanke	11.01.04	1 : 125	C-C	C 03 2147	A
approved: Dr.Kohl	11.01.04				